UNITED
NATIONS

A

General Assembly

Distr.
GENERAL

A/CONF.151/PC/111
2 March 1992
ENGLISH
ORIGINAL: ENGLISH/FRENCH/
SPANISH

PREPARATORY COMMITTEE FOR THE
UNITED NATIONS CONFERENCE ON
ENVIRONMENT AND DEVELOPMENT
Fourth session
New York, 2 March-3 April 1992
Item 2 (b) of the provisional agenda

PREPARATIONS FOR THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT ON THE BASIS OF GENERAL ASSEMBLY RESOLUTION 44/228 AND TAKING INTO ACCOUNT OTHER RELEVANT GENERAL ASSEMBLY RESOLUTIONS: RELEVANT ACTIONS OF INTERGOVERNMENTAL AND OTHER BODIES OF RELEVANCE TO THE PREPARATORY PROCESS

Protection and promotion of human health

(Section I, chapter 5 of Agenda 21)

Note of the Secretary-General of the Conference

1. The World Health Organization Commission on Health and the Environment was appointed in early 1990 and concluded its work in October 1991. Its task was to make an inventory of the present knowledge of the impacts of environmental changes on human health, to indicate areas where further research was needed, and to lay the basis for developing strategies to tackle problems of health and the environment in the future.

2. The Commission was established to follow up the report of the World Commission on Environment and Development and to provide a direct input to the preparations for the United Nations Conference on Environment and Development, particularly with regard to human health aspects of Agenda 21. Consequently, the findings and recommendations of the Commission were duly taken into consideration when document A/CONF.151/PC/100/Add.5 was prepared.

3. The summary of the report of the Commission is annexed to the present note.

ANNEX

Summary of the report of the World Health Organization Commission on Health and the Environment*

TABLE OF CONTENTS

Preface i

Health and the environment 1

Integrating development, the environment, and health 2

Global challenges to health and the environment 3
- Population 3
- Poverty 4
- Resource use 4
- Macroeconomic frameworks 5

Food and agriculture 5

Water 7

Energy 9

Industry 12

Human settlements, urbanization, and basic services 14

Transboundary and international issues 17
- Acid precipitation 17
- The ozone layer 17
- Greenhouse gases 18
- Hazardous wastes 19
- Oceans 19
- Biodiversity 19

Strategy and Recommendations 20

Annex 1: Members of the WHO Commission on Health and Environment 23

---

* The annex is circulated in the languages of submission only.

/...

Preface

The WHO Commission on Health and Environment was appointed by the Director-General of WHO as a fully independent body in early 1990. Composed of 22 members (Annex 1), the Commission was chaired by Madame Simone Veil, France, Member of the European Parliament. H.E. Dr E. Salim, Minister of State for Population and the Environment, Indonesia, and Professor N.F. Izmerov, of the Academy of Medical Sciences of the USSR, served as Vice-Chairmen.

The work of the WHO Commission can be regarded as a follow-up of the 1987 report, Our common future, of the World Commission on Environment and Development (WCED). That report reviewed the relationship between the environment and development, and methods of assuring the progress of mankind while respecting the environment so as to make it possible to bequeath it in a healthy condition to future generations. Although the relationship with health was not considered in detail in the WCED report, concern for health underlay most of it. It therefore seemed opportune, three years later, for an independent body to make an assessment of the health consequences of environmental change, especially in anticipation of the United Nations Conference on Environment and Development which will be held in Brazil in 1992. The Director-General considers the report of the Commission on Health and Environment to be WHO's main contribution to that Conference, one that underlines the importance of health in environmentally sound and sustainable development.

The Commission had the support of four independent expert panels appointed by the Director-General, on food and agriculture, energy, industry, and urbanization - four areas that cover the main aspects of development. Professor E.H. Kampelmacher (Netherlands), Dr B.H. MacGibbon (United Kingdom), Dr B.D. Goldstein (USA) and Mr M. Diop (Senegal) were appointed respectively chairmen of the food and agriculture, energy, industry and urbanization panels. In the absence of Mr Diop, Dr B.W. Christmas (New Zealand) chaired the panel on urbanization.

The Commission held three meetings. The first (June 1990) was devoted to planning the work of the panels, the second (March 1991) to developing the structure of its report, and the third (July 1991) to the drafting and adoption of the report. While the Commission takes full responsibility for its own report, it acknowledges that much of it is based on the reports that the panels

prepared under their own responsibility. Any discrepancy between the panels' and the Commission's conclusions and recommendations must therefore be attributed to the fact that Commission and panels worked independently of each other, the panels, owing to their mandate, taking a more sectoral approach than the Commission.

The meetings of the Commission were attended by representatives of a number of United Nations Organizations, other international organizations, and nongovernmental organizations.

The Commission wishes to express its indebtedness to Mr D.E. Satterthwaite, who was responsible for the preparation of the first draft of the report and gave invaluable assistance to the Commission throughout its work.

/...

Health and the environment

The maintenance and improvement of health should be at the centre of concern about the environment and development. Yet they rarely receive high priority in environmental policies and development plans. They rarely figure as important items in environmental or development programmes, despite the fact that the quality of the environment and the nature of development are major determinants of health.

Indeed, the most immediate problems in the world are ill health and premature death caused by biological agents in the human environment: in water, food, air, and soil. They contribute to the premature death of millions of people (mostly infants and children) and to the ill health or disability of hundreds of millions more. The problem is most acute in the developing countries where:

- four million infants or children die every year from diarrhoeal diseases, largely as a result of contaminated food or water.
- two million people die from malaria each year and 267 million are infected.
- hundreds of millions suffer from debilitating intestinal parasitic infestations.

Serious environmental health problems are shared by both developed and developing countries, affecting:

- hundreds of millions of people who suffer from respiratory and other diseases caused or exacerbated by biological and chemical agents, including tobacco smoke, in the air, both indoors and outdoors.
- hundreds of millions who are exposed to unnecessary chemical and physical hazards in their home, workplace, or wider environment (including 500 000 who die and tens of millions more who are injured by road accidents each year).

Health also depends on whether people can obtain food, water, and shelter. Over 1000 million people lack the income or land to meet such basic needs. Hundreds of millions suffer from undernutrition.

It is a requirement of health that the global cycles and systems on which all life depends are sustained. Population growth and the

way resources are exploited and wastes generated threaten the environmental base on which health and survival depend and transmit the growing costs to future generations. The toll they exact on human health and natural resources and systems could be enormously reduced by better environmental management.

Integrating development, the environment, and health

Health depends on our ability to understand and manage the interaction between human activities and the physical and biological environment. We have the knowledge for this but have failed to act on it, although we have the resources to meet current and future needs sustainably.

Two concerns are vital: development addressing people's needs, especially for health; and ecological sustainability so that natural resources are not depleted and natural systems not damaged or degraded. Meeting the needs of the present and future world population for food, water, and energy without depleting or damaging the global resource base, while avoiding the adverse health and environmental consequences of industrialization and uncontrolled urbanization, can be achieved only if people have the knowledge and the means to influence action. This calls for changes in the way governments plan ar manage development. In agriculture, research and extension services are required that are more participatory and more responsive to the needs of poor farmers. In urban areas participatory partnerships between local authorities and community organizations need to be developed. People dependent on natural resources should be fully involved in decisions about their use and protection. All groups, including those who are living and working in the least healthy environments or are currently excluded from decisions about how resources should be used, should share in decision-making and action.

Local participation needs national and global frameworks to ensure that adequate knowledge and resources are available and that local actions do not result in an unsustainable burden on natural cycles and systems. It also requires inter-governmental agreements that limit each country's call on finite resources and its right to dispose at will of non-biodegradable wastes. For this, we need people whose concerns go beyond the quality of their own environment; only they can press their governments to reach the international consensus on which a healthy and sustainable planet depends.

Global challenges to health and the environment

Any discussion of health, the environment, and development must include consideration of the size of the population and its consumption level, since this combination largely determines the impact that the human population makes on the environment. It must include the distribution of income and assets, the prime concern being for people whose health is impaired by lack of them. It must also include the macroeconomic framework within which governments set their economic, social, and environmental policies. While the priority is to change the sectoral policies of governments and international agencies so as to promote health and sustainability, macroeconomic policies affect all sectoral policies.

Population

The world's population grew more than fivefold between 1800 and 1990 to reach over 5000 million; projections suggest 8000 million by 2020. In developing countries, where populations are still expanding, pressure on scarce resources has made it difficult to improve living conditions; in the towns and cities the authorities have rarely been able to provide the extra services required by the rapid growth in population. In developed countries, where population levels are largely static, prosperity has given rise to increased consumption and even overconsumption with insufficient regard being paid to their possible planetary impact: the depletion of non-renewable resources, the degradation of soil and water resources, and the emission of gases that threaten climatic stability and the stratospheric ozone layer. Such consumption levels raise the question of sustainability, especially as a growing proportion of the world's population aspires to comparable levels of consumption.

Healthier environments and lower death rates are not inconsistent with the goal of reducing population growth rates. Indeed, the steps that reduce infant and child deaths also tend to encourage reduced fertility rates: a secure livelihood, better health and education of the mothers, improved water supplies, sanitation, and nutrition, all coupled with effective family planning programmes integrated into health care systems available to all. Where serious measures are taken for a sustained reduction in child mortality, the fertility rates eventually fall. Sustaining reductions in fertility requires policies that remove the economic necessity for poorer groups to have large families. But the pressure on resources of growing populations and growing consumption levels is so severe that to wait for economic expansion to reduce fertility would be disastrous.

Provision of a secure livelihood, education, and health care (including the means to control fertility) is therefore a high priority.

Poverty

At least 1 115 million people were classified as poor in 1985 and 630 million of these were living in extreme poverty. Such statistics cover only those with an inadequate income. The number lacking a minimum standard of living is much higher. Those who cannot read, obtain clean water, or avoid environmentally induced disease, and who are permanently under the threat of physical violence and the effects of crime are invariably poor, whatever their income. So too are those who cannot participate in community life or expect to live beyond the age of 60. If poverty is measured by the number of people lacking a standard of living that includes adequate food, safe and sufficient water, sanitation, a secure shelter, and access to education and health care, over 2 000 million people live in poverty - some 40% of the world's population. A high proportion are women and children, who are more vulnerable to environmental health risks. Within households it is generally women who look after the children, manage the household, and care for the sick; as such they suffer more from the diseases associated with inadequate water and sanitation and from the defects in the provision of basic services. Women who head households also usually face discrimination in looking for jobs and in obtaining access to public services, housing, and credit.

Resource use

The impact of any population on the environment depends on the type and level of its resource use and on its waste generation and management. Most of the world's consumption of non-renewable resources is concentrated in Europe, North America, and Japan. Per caput consumption levels in the richest countries are 50 or more times higher than in the poorest countries. The OECD nations, with 15% of the world's population, are responsible for 77% of all hazardous industrial waste. More than 80% of the gases in the atmosphere that contribute to the greenhouse effect, arise from production or consumption in the developed world.

A healthy population may require a relatively prosperous and stable economy, but this need not imply the levels of income and resource consumption common in developed countries. Many communities with a relatively low level of income have made substantial improvements in health; some have achieved a life expectancy close to that of West Europe and North America with a much lower level of resource use. Improved health can be separated from ever increasing consumption if development programmes stress

the promotion of health both in the narrow sense of curing or preventing disease and in the broad sense of promoting well-being and informed participation.

Macroeconomic frameworks

Macroeconomic policies are major influences on the state of health and of the environment within all countries. But they are usually established with little or no consideration given to their health or environmental consequences. For example, trade and fiscal policy or agricultural or energy pricing may influence health either by their effect on income levels and distribution or by the effect on the quantity and quality of land, air, and water resources. Macroeconomic policies influence the extent to which health care and health-related services are funded. They also affect the size of household incomes, and hence the quality of food and housing affordable.

Macroeconomic policies should minimize conflicts between economic, environmental, and health goals. With increased knowledge of the social and environmental effects of macroeconomic policies, the effects can be limited, including those which arise from structural adjustment, and special programmes can be established for those whose health might otherwise suffer from loss of income or cuts in services - for instance health care or nutrition programmes or employment projects.

Food and agriculture

Agriculture, forestry and fishing provide not only the food and natural resources on which human society depends but also the livelihood of about half of the world's population. Their output can only be sustained if the ecological systems on which they draw are not overexploited.

The output of the world's food-producing systems has greatly increased over the past few decades. As yet there is no global shortage of food or the capacity to produce it in the world. But for a large part of the world's population undernutrition and the infections associated with it will remain the main cause of ill health and premature death because they lack the land to grow the food they need or the income to purchase it. Foodborne diseases are among the most common diseases in every country, although they are far less often life-threatening in developed countries. Most disease agents that contaminate food and water are biological and come from human or animal excreta, although food contaminated by toxins produced by

plants and moulds and those present in fish and shellfish can be a serious problem.

The ecological base for feeding the world's population is under stress owing to the rapid degradation of land and water resources. Production and distribution methods remain inefficient, as is shown by the size of the losses before and after harvesting. A continued rise in the populations in virtually all developing countries, greater substitution of meat, eggs and dairy products for grains and vegetables, and increased food and soil losses put great stress on farmers and on the ecological underpinnings of farming systems. Conversely, reduced population growth, better balanced diets, changes in production techniques, and greater attention to reducing food losses make it possible for farmers to sustain production and meet future demands.

Agriculture is not without occupational health risks, of which accidents, infection with diseases spread by animals, and exposure to agricultural chemicals are the most common. In tropical countries, reservoirs and water supply and canals for irrigation have been constructed and new land opened up for agricultural use without proper control of disease vectors. The result is that they have often been followed by a great increase in many of the most lethal and debilitating diseases, including malaria and schistosomiasis.

Agricultural chemicals are widely misused, most seriously in developing countries where pesticide regulations and their enforcement are less strict and products that have been banned or restricted in developed countries are still widely available. Agricultural chemicals are damaging water resources. Drainage water often contains high levels of salts and nutrients, the latter causing blooms of algae in lakes, reservoirs, and shallow coastal waters.

Health and its environmental determinants are closely related to land tenure. Farmers with secure tenure of adequate amounts of fertile land usually avoid extreme poverty and the ill health that accompanies it. Those with little security and too little with land or with holdings of only marginal productivity are often poor; so is their health. Many small farmers have developed a sophisticated knowledge of how to sustain yields in difficult circumstances. However, environmental degradation is common where high concentrations of poor farmers have only land of poor quality to exploit.

Certain strategic principles can promote health and more sustainable patterns of food production. They include the promotion of good agricultural practice (for instance, crop rotation, avoidance of

excessive fertilizer application, use of correct dosage of chemicals for pesticides, reduction of food losses before and after harvesting). They also include wider use of integrated pest control and better integration of farming, forestry, and water resource management. Several major innovations are likely to prove of particular importance for increased food production or better preservation; they include food irradiation and the use of modern biotechnology to improve productivity and processing.

The Commission recommended that:

- countries should take steps to ensure that all households can afford and obtain an adequate diet; and in particular that income and employment programmes should play a role in ensuring that everyone has the means to acquire sufficient food.

- efforts to increase food production should be accompanied by measures to protect and enhance land and water resources.

- research and extension services should be more participatory, more responsive to the needs of small and poor farmers, including those dependent on poor-quality or fragile land, and give more attention to health and environmental issues.

- governments should integrate health goals in their agricultural policies, including promotion of the health of farmers and agricultural workers.

- more research should be carried out on how to increase food production in the tropics while reducing tropical diseases and harmful effects on the environment.

- governments should give high priority to reducing food losses before and after harvesting.

Water

Fresh water is considered a renewable source, but there are limits on the supplies available. In many countries or regions shortages of fresh water are the main obstacle to agricultural and industrial production. Some of such shortages (or seasonal or annual variations in supplies) lead to poverty and soil degradation. Many cities and agricultural regions are now drawing supplies from

underground aquifers at a rate far above their natural rate of recharge.

Fresh water is essential to health not only for its part in production but also for domestic consumption and use (drinking, cooking, washing, laundry). A high proportion of life-threatening and health-threatening infections are transmitted through contaminated water or food. Nearly half the world's population suffers from diseases associated with insufficient or contaminated water, mostly the poor and virtually all in developing countries. Two thousand million people are at risk from waterborne and foodborne diarrhoeal diseases, which are the main cause of more than five million child deaths each year. Schistosomiasis (200 million people infected through contact with contaminated fresh water) and guinea-worm (10 million infected through drinking water containing the microscopic disease vector) are two water-based diseases. Insect vectors breeding in water transmit malaria (267 million infected), filariasis (90 million infected), onchocerciasis (18 million infected), and dengue fever (30-60 million infected every year).

Water shortages usually lead to problems of water quality since sewage, industrial effluents, and agricultural and urban runoff overload the capacity of water bodies to break down biodegradable wastes and dilute non-biodegradable ones. Water pollution problems are most serious in cities in developing countries where controls on industrial emissions are not enforced and sewers, drains, or sewage treatment plants are lacking. Sewage and industrial effluents can be treated before disposal if sewers exist and the regulatory authorities are effective. Agricultural and urban runoff cannot be treated and in many areas in both developed and developing countries it is a growing threat to the quality of lakes, rivers, and the groundwater. Fisheries have been damaged and drinking-water sources contaminated by pollution in many areas of the world.

The Commission stressed that:

- Fresh water should be considered as a scarce, valuable, and finite resource and water resource management should be promoted to reconcile competing demands from different sectors and consumers.

- Because of the immense effect of water-related diseases on human health, a greater priority should be given not only to ensuring safe and sufficient water supplies but also to sanitation and to increased education about personal hygiene. Improving the quantity and quality of water and providing safe excreta disposal services are usually possible at relatively low

cost, especially if optimal use is made of local knowledge and resources and the users are fully involved in the design, implementation, and management of the services provided.

- Fresh water should be priced and protected in accordance with its value to health and to production. Innovative schemes can often reach poorer groups with major improvements at a cost they can afford. Preferential tariffs or subsidies should be avoided for most consumers and used only to ensure that the poorest receive a level of service sufficient for health.

- The priority for water pollution control in the world is the control of bacteriological and parasitic waterborne diseases, but contamination of water by heavy metals and other chemicals should also be prevented or minimized.

- More emphasis should be placed on making the best use of existing water supplies; drinking water shortages can often be remedied by greater attention to maintenance (since up to 60% of water supplies in a piped system may be lost in leaks) and by charging the users of the largest amounts of water a realistic price.

Energy

The main goals of energy development have been to reduce the cost of producing energy, to make systems more efficient, and to open up previously untapped energy sources. Reducing the adverse environmental and health effects has also become a goal. More recently, concern about climatic change has emerged since the combustion of fossil fuels, which accounts for nearly 90% of the world's commercial energy production, is the largest source of the so-called greenhouse gases.

People in developed countries use roughly ten times more commercial energy than those in developing countries and burn 70% of all the fossil fuel used, most of it for electricity generation, industry, transport, and domestic heating. To strengthen their economies and so provide the economic basis for good health, most developing countries will need to increase their fossil fuel consumption.

One of the Commission's central concerns was whether the need for developing countries to increase their use of fossil fuel can be met at the same time as the adverse health effects are reduced,

especially indoor air pollution from coal and urban air pollution from fossil fuel use, within a global agreement that limits greenhouse gas emissions.

Fossil fuels are the single largest source of atmospheric pollution; when burnt, they release in the air particulate matter, carbon monoxide and dioxide, oxides of nitrogen and sulfur, and metal compounds. More than 1 000 million city dwellers are now exposed to high levels of air pollution. High levels of sulfur dioxide and particulates in urban areas have been associated with respiratory disease and increased mortality. Vehicle exhausts pollute the air in large cities with carbon monoxide and with lead (except where lead additives to petrol are no longer used). Exposure to the latter may impair mental development in children. Vehicle emissions also contribute to the formation of ozone and photochemical smog, which may decrease lung performance. Several studies have shown an association between levels of air pollution and respiratory symptoms, but it is still uncertain whether protracted exposure to low levels of air pollutants such as occur in many cities of the developed and developing world has any long-term effects on health. However, policies, regulations, and incentives can greatly reduce air pollution and increase the efficiency with which fossil fuels are used. Their adoption in many developed countries has improved air quality in a number of cities in recent years.

Indoor air pollution from the combustion of coal or unprocessed biomass fuels (e.g., wood, crop wastes) represents perhaps the largest energy-related source of ill health. Biomass fuels are used to meet the energy needs of nearly half the world population. They are often burnt in open fires or inefficient stoves in poorly ventilated houses, and give off smoke and chemicals that contribute to respiratory disease, with long term cardiovascular effects. Because of the presence of known carcinogens in the indoor air, an increased risk of lung cancer must be assumed. Women are generally responsible for cooking and looking after children in the home and they and their children are at greatest risk.

There are a number of alternatives to fossil fuels and unprocessed biomass, including hydropower, nuclear energy, and solar power. Hydropower can bring extra benefits such as flood control and an increased supply of water for drinking and irrigation. However, dams can cause environmental changes that affect health: people living in the flooded area must be resettled, the quality and reliability of the water supply downstream are often reduced and, in the absence of appropriate control measures, the large area of water behind the dam can become a breeding ground for disease vectors (including those of schistosomiasis and malaria). Smaller hydro-systems that

draw power direct from flowing rivers can avoid most of these health, social, and environmental costs.

Nuclear energy is another option. Under normal working conditions discharges from power plants result in exposures to levels of radiation about 1 000 times lower than natural background levels. However, the risk of accidents and the difficulty of safely disposing of high level radioactive waste are major concerns of the public. Moreover, nuclear power is rarely an appropriate choice for developing countries. The use of direct solar and wind energy is likely to increase, although it will be limited by cost and space requirements.

Electricity use is likely to continue growing rapidly, since it provides the energy for virtually all communications and most lighting and mechanical work apart from road transport, and is essential to development and to the operation of medical services. The expansion of electricity supplies has led to increased exposure of the population to electromagnetic fields. Only since 1979 has it been suggested that such exposure may increase the risk of some cancers. No clear evidence has been obtained that such exposure is harmful, but the possibility requires investigation.

The Commission stressed five priorities for a national strategy:

- The reduction of indoor air pollution from the domestic use of coal or unprocessed biomass fuels in developing countries (e.g., by the use of improved stoves and ventilation), the local adoption of biomass processing techniques to produce cleaner fuels, or a switch to cleaner fuels.

- The reduction of urban air pollution from the fossil fuels used for energy production and transport in both developed and developing countries by adoption of mitigating technologies at source (particularly in new thermal power plants and vehicles), improved public transport systems, and greater priority for practical alternatives to the use of petrol.

- The reduction of the potential risk of climatic change by achieving a balance between the need for increased use of fossil fuels in many developing countries and reduction in carbon dioxide emissions and acidic aerosol production from the combustion of fossil fuels in developed countries. Achieving greater energy efficiency through such measures as the wider adoption of co-generation plants and more efficient end-use devices and the wider adoption of energy conservation

measures should be the goal in both developed and developing countries.

- More resources for research and development and wider use of renewable energy sources aimed at lowering the costs of waste incineration, and at exploiting solar and wind power and the possibilities of small-scale hydro-electricity generation.

- Continuing research and development on major accident prevention, particularly the development of inherently safe nuclear reactors. Developing the capacity for the safe transport and storage of high-level nuclear waste is an important safety issue.

Industry

Industrialization has made many positive contributions to health, among them increased personal incomes, greater social wealth, and improved services, particularly transport and communication. But industrial activities carry the risk of adverse health consequences for the workforce and the general population, either directly through exposure to harmful agents or practices or indirectly through environmental degradation. Industrial emissions and products also threaten the global environment.

Industrial practices in both developed and developing countries produce adverse environmental health consequences through the release of air and water pollutants and the generation of hazardous wastes. Occupational diseases include silicosis, pneumoconiosis, lead and mercury poisoning, hearing loss, and skin diseases. Serious health risks are also faced by workers in small-scale or cottage industries, where exposure to toxic chemicals and accident rates are often higher than in large industries.

Industrial emissions have polluted many rivers, lakes, and coastal environments, especially in developing countries where pollution control is rarely enforced. A number of major accidents in developing countries such as the release of chemicals or explosions have been dramatic reminders of the adverse health effects of inadequate attention to safety and prevention. Only in a minority of countries are potentially dangerous industries sited away from population concentrations. In most countries too little attention is given to controlling the disposal of hazardous industrial and commercial waste so as to prevent human exposure and leakage into the environment.

There is a serious lack of quantitative data on the links between environmental agents and health effects. It has been difficult to establish the relation between industrial emissions, and especially long-term low-dose exposure to them, and the health of the general population because factors other than industrial pollution are implicated. More is known about health risks inside industry and this information has contributed to the identification of health risks for the general public. Health problems are most severe in developing countries, where fewer health standards are applied to limit workplace exposure. Even where standards exist, many nations have neither the funds nor the institutional structure to ensure that they are upheld. Partly for these reasons, there has been a transfer of some hazardous industries to developing countries.

The Commission stressed the need in each country for:

- a planning process where health and environmental considerations influence decisions about plant siting, design characteristics, the choice of process, and the incorporation of safety and pollution control devices

- the adoption of "the polluter pays" principle to control liquid and gaseous emissions and placing the full responsibility on the producers of hazardous wastes

- a higher priority for the control of air and water pollution, including fitting control technology on existing plants to protect the health of the workers and the public; the direct and indirect costs of health effects should be included in decisions about the economic feasibility of such controls

- more attention to monitoring the release of industrial discharges and quantifying the health and environmental effects, concentrating on susceptible populations and on the long-term as well as the short-term consequences

- educational and training activities for six groups: health care professionals, particularly in developing countries; workers and managers in health and safety and in the prevention of environmental releases and the reduction of wastes; decision-makers, who need to incorporate health and environmental costs into decisions; journalists and other workers in the media; the public and especially schoolchildren, to increase their understanding of environmental problems; and experts, including environmental scientists, to train and give advice to the other groups

- addressing the occupational and environmental health problems in small-scale industries

- adherence to global agreements on the management of wastes to prevent transport accidents and the export of hazardous industries or hazardous wastes

- increased understanding of the interaction between chemical or physical agents and biological systems so as to improve recognition, and prediction of the consequences of industrial releases. The use of area profiles within which exposure data and health manifestations are carefully monitored over many years will help such understanding.

Human settlements, urbanization, and basic services

Environmental management is needed in all settlements to provide water, protect public spaces, remove wastes, and protect air and water quality. Even in a small village water sources must be protected, and all households must be ensured sufficient water. Human and animal excreta must be disposed of in ways that minimize the possibility of human infection and of food and water contamination. As a settlement's population size and density increase from village to market town to major city, so too do the scale and complexity of the environmental management needed to ensure a healthy environment.

Rapidly growing urban centres are a particular challenge for environmental health. Urbanization is usually associated with the development of a more productive economy, and it can bring major benefits to health and the environment; the concentration of population and business lowers the unit cost of piped water and health services, sanitation, and the collection and treatment of household and commercial wastes. But in the absence of government action to ensure that the infrastructure and services are in place and pollution controlled, environmental health problems are greatly exacerbated.

These problems are particularly apparent in developing countries. Despite some slowing of the growth rates in many major cities in recent years, population growth still outstrips the ability of local authorities to provide even minimal levels of service. Local governments are often hampered in their efforts by a weak revenue

base, poor financial management, and few trained personnel, and by budget cutbacks that cause a further decline in the coverage and quality of the water, sanitation, refuse collection, and health care services.

Housing problems are widely different in developed and developing countries. In the former the major issues concern the design, the physical structure, and the living environments of poor quality that are associated with physical and psychosocial health problems contributing significantly to ill health in the urban areas affected. Legislation exists to ensure adequate standards in many of the areas listed above, but improved building and safety standards are still needed.

Housing should contribute to a sense of well-being and security. Poor housing is associated with social and psychological problems, including alienation, isolation, drug abuse, family break-up, and urban violence. Strong community networks can act as a buffer against the psychosocial effects of poor physical environments. Action to improve psychosocial health often combines improved services and employment opportunities. A related issue is noise, at home and at work, which can result in hearing loss, sleep disturbance, impaired mental performance, increased anxiety, and aggression.

Much of the housing in both the rural and the urban areas of developing countries lacks the most basic requirements for health. More than 2 000 million people live in life-threatening and health-threatening housing and living environments. Most of the housing is overcrowded; space is nearly always at a premium, and many families live in one-room shelters or single rooms in tenements. Such overcrowding encourages the spread of acute respiratory infections, tuberculosis, meningitis, and intestinal parasites. Four or more persons to a room make it almost impossible to protect infants and children from burns or scalds and to store safely hazardous household substances such as bleach or kerosene. In urban areas a high proportion of housing is illegal settlements built of flammable materials; many dwellings are built on land prone to flooding, on steep hillsides or otherwise dangerous sites. The low commercial value of such sites means that the inhabitants have a greater chance of not being evicted.

Most of the poor have incomes that are too low to enable them to afford better housing with adequate space, security and services. Fear of eviction is a constant worry for most tenants and inhabitants of illegal settlements. The risk of infection, particularly from pathogens associated with excreta, is high. Most illegal settlements have only rudimentary water supply systems and no sewers or drains.

An estimated 30-50% of the solid wastes generated in urban areas in developing countries is left uncollected.

Most poor people in developing countries have no health service to turn to when they are sick or injured. Some 1 600 million have no access to health care. In the least developed countries more than half the population may have no access to health services. Health services are particularly important for vulnerable groups, especially for prevention and rapid treatment of common illnesses. Although the proportion of pregnant women and children covered by immunization has grown considerably in recent years, hundreds of millions remain unprotected and millions die each year from diseases that could be prevented by immunization. Most spending on health is still for curative services, usually in major hospitals, although preventive and community primary health care services are far more effective in reducing morbidity and mortality.

Enough knowledge and resources exist in most developing countries to improve housing and basic services at a relatively low cost. New participatory partnerships between local authorities, nongovernmental organizations, and community organizations have shown this to be so and have proved cost-effective. Institutional frameworks at national and local level are needed to encourage and support these partnerships.

The Commision's recommendations included:

- high priority for the provisioning of all forms of housing with sufficient supplies of water and services for the hygienic disposal of wastes, and for the education of their inhabitants in personal and domestic hygiene

- greater priority to ensuring that all individuals or households can afford to purchase, rent, or build adequate housing on safe sites

- the development of new urban and rural planning structures and processes that are more participatory, work with community organizations, and meet the identified health needs of the poorer groups

- higher priority for the provision of primary health care into which national population policies are fully integrated

- a much more active role by health personnel in the planning and implementation of community development projects; health personnel should have the knowledge and skills to work with

other social services, especially in the provision of child care for working and sick parents, shelter for the homeless, care for the disabled, and services to cope with violence and drug and alcohol abuse

- the development of national strategies to reduce overconsumption and waste generation and encourage resource conservation and recycling

- increased research on the health status of urban populations, on the methodologies used in successful community health projects, on low-cost appropriate technologies related to housing and services, and on the development of models allowing choices to be made between alternative methods of waste disposal.

Transboundary and international issues

Certain environmental issues have health implications on a wider scale than the local or national level. They include the long-range transport of air pollutants, the transboundary movement of hazardous products and wastes, stratospheric ozone depletion, climatic change, ocean pollution and biodiversity. Solutions are being sought mainly through intergovernmental agreements.

Acid precipitation

Sulfur and nitrogen oxides emitted from tall chimney stacks by fossil fuel-fired power stations are transported long distances, often across national boundaries. In the atmosphere they are converted to acids and eventually fall to ground as acid rain or snow. This has acidified many poorly buffered lakes and soils and contributed to forest dieback and in many places (especially Central Europe) to the destruction of large forests. Health may be affected if acidified water is used untreated in water supplies, since it contains higher concentrations of metals, e.g., copper and lead from pipes, cadmium from plumbing solder, and mercury and aluminium from soils. Progress towards reduction in atmospheric pollution in Europe is being achieved through implementation of the 1979 Convention on Long Range Transboundary Pollution and its protocols.

The ozone layer

The stratospheric ozone layer is being damaged by the release into the atmosphere of various chemicals, including

chlorofluorocarbons used in refrigerants, aerosols, plastic foam blowers and other equipment, halons used by fire fighting services, and various organic solvents. Depletion of the ozone layer is likely to lead to higher levels of biologically active ultraviolet radiation at the earth's surface. At certain wavelengths, UV radiation increases the incidence of skin cancer and cataract in humans and probably affects other organisms that have no protection against it. Small changes in recreational habits, such as the avoidance of sunbathing at midday and the use of protective clothes and creams, could do much to reduce the health risks. International efforts are being made to control the production and consumption of some of the chemicals responsible through the Montreal Protocol to the Vienna Convention on the Protection of the Ozone Layer. They should be strongly supported.

Greenhouse gases

A related issue concerns the build-up of greenhouse gases in the atmosphere, though likely to lead to global warming and a rise in the sea level. During the 1980s carbon dioxide emissions, mostly from fossil fuel combustion, were responsible for more than half of the total warming effect, and chlorofluorocarbons for a quarter. Uncertainties about the magnitude, rate, timing, and distribution of any future warming make it impossible to predict the health implications quantitatively.

Heat stress and heat stroke, which can be fatal, are a direct effect that may become more common, particularly among susceptible groups such as the old, the young, and those with cardiovascular disease. The indirect health effects, however, are likely to be much more significant. Agriculture may be affected, in some areas by increased precipitation, in others by drought and desertification. Changes in rainfall may diminish the variety of crops available and lead to or aggravate food shortages. The distribution of vectors that carry the agents of infectious diseases is likely to be affected; diseases such as malaria may spread to areas where they are currently unknown. The adverse effects would be especially serious in developing countries, where lack of human, financial, and technical resources would hinder an effective response.

The seriousness of the possible health and environmental consequences of global warming is such that every effort should be made to reduce greenhouse gas emissions now, through individual efforts and through such measures as are now being developed by the United Nations.

Hazardous wastes

Hazardous wastes are exported from developed to developing countries when the export cost is much lower than the cost of disposal in the country of origin. Disposal abroad is rarely accompanied by concern about the health of those involved or those living near disposal sites. The growing concern about the health and environmental implications led to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. Once in force, this should considerably reduce the risks arising from such movement.

Oceans

Large stretches of coastal waters, especially in semi-enclosed seas and where tidal flushing is limited, are heavily polluted by industrial and domestic wastes from rivers and outfalls, land run-off, and accidental spills. Biological and chemical pollution is high near river mouths and sewage outfalls. Fishing beds and beaches in their vicinity are at particular risk of contamination. Seafood poisoning and epidemics, such as the cholera epidemic in Latin America in 1991, may result from disposal of inadequately treated effluents into the sea.

Beyond the coastal waters the open sea is still relatively unpolluted. Although contamination by metals and organic compounds can be detected, the level is not yet significant for human health, and biological contamination from domestic effluents is virtually non-existent.

The need to improve the quality of coastal waters and to preserve that of the open ocean has led to the adoption of a number of international agreements. Their extension to the many ocean areas that are not yet covered should be greatly accelerated and ways and means for their rigorous implementation should be provided.

Biodiversity

Biodiversity is acknowledged as a condition for the long-term sustainability of the environment and its current destruction must be halted. Knowledge about many species is still limited and their destruction may deprive the human population of future sources of food and medicine and of biological means of controlling pests and pathogens. However, the protection of biodiversity cannot be unconditional; there may be conflict between the need to improve health or meet necessities and the need to preserve a species. In such

instances the health cost of ensuring the survival of species that are pathogenic to human or are pests of food crops will need to be carefully taken into account. There seems for example to be little ground for preserving the human immunodeficiency, smallpox, or poliomyelitis viruses, malaria parasites, or guinea-worm. An international convention on biological diversity is currently being developed by the United Nations Environment Programme.

Strategy and Recommendations

People need to have the means to acquire the resources on which health depends: safe food and water, fuel, and a secure shelter. They need to be protected not only from physical, chemical, and biological hazards, but also from crime and violence, which are encouraged by poverty and the use of drugs, and from injuries at their place of work. A healthy environment is not only a need, it is also a right; the right to live and work in an environment conducive to physical and mental health is enshrined in the Universal Declaration of Human Rights. Everyone shares the responsibility for ensuring that this right is duly acknowledged.

Everyone shares responsibility for health and for passing on to our children a world whose resources are not depleted and whose natural systems are not degraded. There is a powerful synergy between health, environmental protection, and sustainable resource use. Individuals and societies who share the responsibility for achieving a healthy environment and managing their resources sustainably become partners in ensuring that global cycles and systems remain unimpaired.

The responsibility for action lies with individuals and with business. Governments have the responsibility of setting up the strategic and institutional framework within which action is taken. They should put in place the services, financial and other incentives, and controls that encourage individuals, households, communities, business, and bureaucracies to promote health and sustainable resource use. They should take the lead in ensuring that the levels of consumption and waste generation within their boundaries do not damage global systems and deplete resources known to be finite.

There are three main global objectives:

- Achieving a sustainable basis for health for all. This demands a slowing down and eventual halt to population growth as soon as possible, and the promotion of lifestyles and patterns of

consumption among affluent groups and developed countries that are consistent with ecological sustainability.

- Providing an environment that promotes health. This involves reducing the risk of physical, chemical, and biological hazards and ensuring that everyone has the means to acquire the resources on which health depends.

- Making all individuals and organizations aware of their responsibility for health and its environmental basis. Health professionals should take the lead in moves to improve the environment and to inform governments and the public about the health implications of development and the costs and benefits of different options to reduce health risks.

Two principles are central to a healthier and more sustainable planet: first, more equitable access to resources within and between countries; second, citizen participation. Participation can promote health and environmental quality because it provides a means of organizing action and motivating individuals and communities. It enables individuals and communities to shape policies and projects so that they meet their priorities. Involvement in planning gives people the possibility to influence choices about the use of limited resources. Primary environmental care is one way of helping communities to apply their skills and knowledge to satisfy their own needs, improve their own environment, and promote the sustainable use of resources. Participatory political structures are a check on abuse of the environment, since citizens with clear rights and knowledge and access to a legal system that allows speedy redress can exercise a powerful restraint on those contravening health and environmental regulations.

The Commission's main general recommendations were:

- All governments and international agencies should give higher priority to developing a sustainable basis for the health of their people and countries. Achieving such a sustainable basis for health requires high priority in development policy to reducing population growth, overconsumption and waste generation.

- A rapid and sustained fall in population growth rates is best achieved by providing people with the knowledge and means to control fertility and by dealing with the economic, social, and cultural reasons for large families. The knowledge, capacity, and health of people are the most valuable resource for development; higher priority must be given to primary health

care (including family planning) and education for all groups, especially women.

- Responsible action should be taken at all levels from the individual citizen to the government to reduce overconsumption and the generation of wastes, especially wastes with serious adverse health and environmental effects. High priority should be given to creating awareness and to providing economic and other incentives to encourage conservation and efficient use of resources. The long-term goal is the promotion of lifestyles and patterns of consumption that are consistent with sustainability of development and with health for all.

- Government structures should be changed to give greater priority and support to participation and community-based initiatives. Official bodies and scientific advisers should devise and apply new more participatory ways of working with the poor so that perception of their needs and their knowledge can be used in designing, implementing, and monitoring action.

- Changes should be made in the planning process for social and economic development and in the institutional and regulatory structures of governments to give stronger emphasis to the prevention of environmental pollution, intersectoral decision-making, and participation.

- Governments and aid agencies should give high priority to providing the means and building up the capacity needed by each locality to make the best use of local knowledge, skills, and resources to promote health and environmental quality. This includes providing the education and training needed to enable individuals and organizations to protect the environmental foundation of their own health.

- Governments and international agencies should give higher priority to creating the basis of an international consensus on environmental, economic, and health issues with the aim of alleviating poverty and sustaining the quality of the environment.

- Governments, international agencies, and public and private institutions should develop the national capacity for the systematic collection, analysis, and monitoring of environmental effects on health in the context of development, so that government policies on health promotion and environmentally sound management of industrial development and of rural and urban settlements are based on reliable information.

/...

ANNEX 1

Members of the WHO Commission on Health and Environment

Chairman

Mrs Simone Veil, France
Member, European Parliament since 1979
President, European Parliament, 1979-82
Minister of Health, 1974-79

Vice-Chairmen

Dr Emil Salim, Indonesia
Minister of State for Population and the Environment since 1983
Head of the Environmental Impact Management Agency since 1990
Member of the Indonesian Academy of Sciences since 1981
Member of the People's Consultative Assembly since 1987

Professor Nikolai F. Izmerov, USSR
Director, Institute of Industrial Hygiene and Occupational Diseases, USSR Academy of Medical Sciences since 1971
Assistant Director-General of WHO, 1964-71
Deputy Minister of Health of the Russian Federation, 1961-64
Academician Secretary, USSR Academy of Medical Sciences

Members[1]

Dr Chen Chunming, China
President, Chinese Academy of Preventive Medicine since 1983
Chairman, National Committee on Health Standards since 1984
Professor of Nutrition, Chinese Academy of Preventive Medicine since 1965

---

[1] Unable to attend:

Professor Harald zur Hausen, Federal Republic of Germany
(Director, German Cancer Research Centre)

Dr Saburo Okita, Japan
(Chairman, Institute for Domestic and International Policy Studies; President and Chancellor, International University of Japan; Minister for Foreign Affairs, 1979-80; Chairman, Japanese World Wide Fund for Nature)

Sir Richard Doll, United Kingdom
Emeritus Professor, University of Oxford
Member of Royal Commission on Environmental Pollution, 1973-79
Regius Professor of Medicine, University of Oxford, 1969-79

Dr Abraham Horwitz, Chile
Director Emeritus, Pan American Health Organization
Director, Pan American Health Organization and WHO Regional Office for the Americas, 1959-75
Chairman ACC Subcommittee on Nutrition since 1985
Chairman of the Board of the Pan American Health and Education Foundation since 1988

Professor John M. Hunter, United States of America
Professor, Departments of Geography and Community Health Sciences, and African Studies Centre, Michigan State University since 1967
Lecturer on Geography, Durham University, United Kingdom, 1964-67

Dr Mohammed Kassas, Egypt
Emeritus Professor, Department of Botany, Cairo University
President, International Union for the Conservation of Nature and Natural Resources, 1978-84
Member of the Club of Rome
Member of the Egyptian Academy of Science
Recipient, United Nations Prize for Environment

Dr Roelof J.H. Kruisinga, The Netherlands
President, Committee on Accreditation of Inspectorates and Laboratories since 1990
Member of Senate, 1981-91
Director General of the Dutch Ministry of Public Health, 1979-82
Minister of State for Public Health and Environment, 1967-71
Minister of State for Transportation and Public Works, 1971-73

Dr Philippe Lazar, France
Director General, National Institute of Health and Medical Research since 1982

Dr Adetokunbo O. Lucas, Nigeria
Director, International Health Programs, Department of Population and International Health, Harvard School of Public Health, since 1990
Director, UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases, 1976-86
Chairman, Medical Research Council of Nigeria, 1973-76

/...

Professor Diogo Pupo Nogueira, Brazil
Professor Emeritus, School of Public Health, University of São Paulo
Chairman, Special Commission on Occupational Health, University of São Paulo
Secretary, Brazil International Commission on Occupational Health

Professor Sten Orrenius, Sweden
Director, Institute of Environmental Medicine, Karolinska Institute since 1988
Professor and Chairman, Department of Toxicology, Karolinska Institute since 1984

Dr David P. Rall, United States of America
Director, National Institute of Environmental Health Sciences, 1971-90
Director, National Toxicology Programme, 1978-90

Professor Vittorio Silano, Italy
Director-General for Food Hygiene and Nutrition, Ministry of Health since 1990
Director-General for Prevention of Environmental Pollution and for Environmental Reclamation, Ministry of Environment, 1987-89
Director, Department of Comparative Toxicology and Ecotoxicology, Istituto Superiore di Sanità, 1982-87

Dr Frank E. Young, United States of America
Deputy Assistant Secretary for Health, Science and Environment since 1989-present
Commissioner, Food and Drug Administration, 1984-89
Dean, School of Medicine and Dentistry, University of Rochester, New York, 1979-84
Vice President for Health Affairs, University of Rochester, Rochester, New York, 1981-84
Chairman, Department of Microbiology, University of Rochester, Rochester, New York, 1970-79

Chairmen of Panels

Mr Mamadou Diop, Senegal[2] (Panel on Urbanization)
Mayor of Dakar
President, Thirty-fifth World Health Assembly 1982
Minister of Health

[2] * In the absence of Mr M. Diop, Dr B.W. Christmas served as Chairman of the Panel on Urbanization

Advocate-General of the Supreme Court
Minister of Public Works, Transport and Town Planning

Dr Bernard D. Goldstein, United States of America (Panel on Industry)
Director, Environmental and Occupational Health Sciences Institute since 1986
Professor and Chairman, Department of Environmental and Community Medicine, University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School since 1980
Assistant Administrator for Research and Development, Environmental Protection Agency, 1983-85

Professor E.H. Kampelmacher, Netherlands (Panel on Food & Agriculture)
Deputy Director General, National Institute for Public Health and Environmental Hygiene, 1984-86
Scientific Director, National Institute for Public Health and Environmental Hygiene, 1973-84
Professor of Food Microbiology and Hygiene, Agricultural University, Wageningen, 1971-85

Dr Barbara H. MacGibbon, United Kingdom (Panel on Energy)
Assistant Director (Medical), National Radiological Protection Board since 1988
Senior Principal Medical Officer, Division of Toxicology and Environmental Health, Department of Health, 1983-88
Senior Lecturer/Senior Research Fellow, St Thomas Hospital Medical School, London

---

UNITED
NATIONS

A

General Assembly

Distr.
GENERAL

A/CONF.151/PC/112
12 March 1992
ENGLISH
ORIGINAL: ARABIC/CHINESE/
ENGLISH/FRENCH/
RUSSIAN/SPANISH

PREPARATORY COMMITTEE FOR THE
UNITED NATIONS CONFERENCE ON
ENVIRONMENT AND DEVELOPMENT
Fourth session
New York, 3 March-2 April 1992
Agenda item 2 (b) of Plenary
Agenda item 3 of Working Group II

PREPARATIONS FOR THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT ON THE BASIS OF GENERAL ASSEMBLY RESOLUTION 44/228 AND TAKING INTO ACCOUNT OTHER RELEVANT ASSEMBLY RESOLUTIONS: RECENT ACTIONS OF INTERGOVERNMENTAL AND OTHER BODIES OF RELEVANCE TO THE PREPARATORY PROCESS

PROTECTION OF THE QUALITY AND SUPPLY OF FRESHWATER RESOURCES: APPLICATION OF INTEGRATED APPROACHES TO THE DEVELOPMENT, MANAGEMENT AND USE OF WATER RESOURCES

(Section II, chapter 10 of Agenda 21)

Note by the Secretary-General of the Conference

1. This note has been prepared by the Secretary-General of the Conference in response to Preparatory Committee decision 3/22 of 4 September 1991, in which the Preparatory Committee requested the Secretary-General of the Conference to submit the results of the International Conference on Water and the Environment, held in Dublin, 26-31 January 1992, to the fourth session of the Preparatory Committee. The submission should be accompanied by a factual note identifying cross-references between these results and the revised Options for Agenda 21. The Dublin Statement and the report of the International Conference on Water and the Environment are annexed to the present note (see annexes I and II).

2. As requested in paragraph 4 of decision 3/22, the Secretary-General of the Conference submitted document A/CONF.151/PC/WG.II/L.17 to the International Conference on Water and the Environment. The document and the requests made by the Preparatory Committee in decision 3/22 were brought to the attention of the participants.

3. The Conference took note of the invitation, expressed in paragraph 5 (a) of decision 3/22, to consider this material with particular attention to implementation mechanisms, programme targets and costings. Relevant recommendations are included in the report of the Conference with the exception of costings. Due to lack of time for adequate discussion of cost estimates, this aspect was not addressed in the report.

4. Options for appropriate mechanisms for implementing and coordinating the programmes, as stated in paragraph 5 (b) of decision 3/22, and options for improved coordination and cooperation on water management at the local, national, regional and global levels, as stated in paragraph 5 (c) of decision 3/22, were discussed, and the results are presented in chapters 7 and 8 of the report of the Conference. The following aspects are covered in chapter 7: appropriate levels of management, mechanisms at the national level, transboundary basins, international implementation mechanisms and global coordination. Options for follow-up are identified in chapter 8 of the report of the Conference.

5. The working group themes of the Conference were harmonized with the programme areas of Agenda 21, in response to paragraph 6 of decision 3/22. The impacts of climate change on water resources (programme area G) were combined with water resources assessment (programme area B) in one working group. Drinking water supply and sanitation (programme area D) was dealt with under urban development (programme area E) and rural development (programme area F) respectively. One working group dealt with mechanisms for implementation and coordination in response to paragraphs 5 (a), (b) and (c) of decision 3/22.

6. The member organizations of the ACC Intersecretariat Group for Water Resources and Governments contributed substantially to the preparation and organization of the Conference, as called for in paragraph 7 of decision 3/22. Their contributions, as well as those of some non-governmental organizations, are gratefully acknowledged.

7. In paragraph 8 of decision 3/22 a factual note was requested which would identify cross-references between the results of the International Conference on Water and the Environment and the revised Options for Agenda 21, as given in document A/CONF.151/PC/100/Add.22. Following the order of paragraphs of this document, the corresponding paragraphs of the report of the Conference are listed below.

Revised Options for Agenda 21 (A/Conf.151/PC/100/Add.22)	**Report of the International Conference on Water and the Environment**
paragraphs 7 to 15 on General Objectives	paragraphs 2.2 to 2.5 on Principles (Note: see also Guiding Principles in the Dublin Statement)
23(c)	2.7 and 2.8
23(n)	2.11
23(o)	2.12, 2.13, 2.14 and 2.15
25	2.16
26	2.17
27	2.9 and 2.10
28	7.2, 7.3, 7.4, 7.5(a) to (c), 7.6 and 7.7(a) to (c)
29	2.18, 2.19, 2.20 and 2.21
30	3.1, 3.2 and 3.3
34(a)	3.4, 3.5, 3.6, 3.7 and 3.8 (a) to (e)
34(b)	3.9, 3.10 and 3.11(a) to (e)
34(c)	3.12, 3.13 and 3.14(a) to (f)
34(d)	3.15 and 3.16(a) to (d)
36 and 37	3.15 and 3.16
38	3.21 and 3.22(a) to (c)
40	4.1, 4.2 and 4.3
42	4.9
43(a)	4.4, 4.12 and 4.14
43(b)	4.10
43(c)	4.7
43(e)	4.4(d)
44(a)	4.5(a) to (d)
44(b)	4.11(a) to (e) and (h)
44(c)	4.11(f) and (g)

Revised Options for Agenda 21 (A/Conf.151/PC/100/Add.22)	Report of the International Conference on Water and the Environment
44(d)	4.13(a) to (f)
44(e)	4.15(a) to (d)
44(g)	4.8(a) to (e)
47	4.18
48	4.6
49	4.19
51	4.20 and 4.21
54	5.21
55(a)	5.22(a) to (c), 6.16 and 6.20(i) and (j)
59 and 60	6.14 and 6.15
63(a) to (c)	5.8, 5.11, 5.15 and 5.19
64(a)	5.16(a) to (f)
64(b)	5.12(a) to (e)
64(c)	5.9(a) to (d)
64(d)	5.25(a)
64(e)	5.25(b) and (c)
64(f)	5.20(a) to (e)
73 to 78	6.20(k)
79(a)	6.11 and 6.20(c) to (f)
79(b)	6.8 and 6.9
79(c)	6.7 and 6.20(h)
79(d)	6.10
79(e)	6.5 and 6.6
79(f)	6.12
79(g)	6.13
79(h)	6.13
82	6.20(g)

Revised Options for Agenda 21 (A/Conf.151/PC/100/Add.22)	Report of the International Conference on Water and the Environment
83	6.20(a)
84	6.3, 6.4, 6.17, 6.18 and 6.20(a) and (b)
87	3.17 and 3.19
88	3.18(a) to (d) and 3.20(a) to (c)

8. The Conference addressed a number of key issues which are not yet included, or are given a much lesser emphasis, in the revised options for Agenda 21. These issues are listed below with reference to the relevant paragraphs of the report of the conference.

Issue	Report of the International Conference on Water and the Environment
Holistic water basin management	1.8, 4.16, 4.17, 4.21, 7.4 and 7.6
Participatory approach at all levels	2.2, 2.12, 4.19, 5.5, 6.2(b) and 7.1
Role of women	1.7, 2.4 and 6.2(d)
Economic value of water	2.5, 2.17, 5.10, 6.2(a) and 6.6
Floods and droughts	1.5(f), 3.17, 3.19 and 7.9(f)
Environmentally and socially benign hydropower	2.19
Impact of sea-level rise	3.19 and 3.20

ANNEX I

International Conference on Water and the Environment:

Development issues for the 21st century

26-31 January 1992, Dublin, Ireland

THE DUBLIN STATEMENT

THE DUBLIN STATEMENT ON WATER AND SUSTAINABLE DEVELOPMENT

Scarcity and misuse of freshwater pose a serious and growing threat to sustainable development and protection of the environment. Human health and welfare, food security, industrial development and the ecosystems on which they depend, are all at risk, unless water and land resources are managed more effectively in the present decade and beyond than they have been in the past.

Five hundred participants, including government-designated experts from a hundred countries and representatives of eighty international, intergovernmental and non-governmental organizations attended the International Conference on Water and the Environment (ICWE) in Dublin, Ireland, on 26-31 January 1992. The experts saw the emerging global water resources picture as critical. At its closing session, the Conference adopted this Dublin Statement and the Conference Report. The problems highlighted are not speculative in nature; nor are they likely to affect our planet only in the distant future. They are here and they affect humanity now. The future survival of many millions of people demands immediate and effective action.

The Conference participants call for fundamental new approaches to the assessment, development and management of freshwater resources, which can only be brought about through political commitment and involvement from the highest levels of government to the smallest communities. Commitment will need to be backed by substantial and immediate investments, public awareness campaigns, legislative and institutional changes, technology development, and capacity building programmes. Underlying all these must be a greater recognition of the interdependence of all peoples, and of their place in the natural world.

In commending this Dublin Statement to the world leaders assembled at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in June 1992, the Conference participants urge all governments to study carefully the specific activities and means of implementation recommended in the Conference Report, and to translate those recommendations into urgent action programmes for WATER AND SUSTAINABLE DEVELOPMENT.

GUIDING PRINCIPLES

Concerted action is needed to reverse the present trends of overconsumption, pollution, and rising threats from drought and floods. The Conference Report sets out recommendations for action at local, national and international levels, based on four guiding principles.

Principle No. 1 – Fresh water is a finite and vulnerable resource, essential to sustain life, development and the environment

Since water sustains life, effective management of water resources demands a holistic approach, linking social and economic development with protection of natural ecosystems. Effective management links land and water uses across the whole of a catchment area or groundwater aquifer.

Principle No. 2 – Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels

The participatory approach involves raising awareness of the importance of water among policy-makers and the general public. It means that decisions are taken at the lowest appropriate level, with full public consultation and involvement of users in the planning and implementation of water projects.

Principle No. 3 – Women play a central part in the provision, management and safeguarding of water

This pivotal role of women as providers and users of water and guardians of the living environment has seldom been reflected in institutional arrangements for the development and management of water resources. Acceptance and implementation of this principle requires positive policies to address women's specific needs and to equip and empower women to participate at all levels in water resources programmes, including decision-making and implementation, in ways defined by them.

Principle No. 4 – Water has an economic value in all its competing uses and should be recognized as an economic good.

Within this principle, it is vital to recognize first the basic right of all human beings to have access to clean water and sanitation at an affordable price. Past failure to recognize the economic value of water has led to wasteful and environmentally damaging uses of the resource. Managing water as an economic good is an important way of achieving efficient and equitable use, and of encouraging conservation and protection of water resources.

THE ACTION AGENDA

Based on these four guiding principles, the Conference participants developed recommendations which enable countries to tackle their water resources problems on a wide range of fronts. The major benefits to come from implementation of the Dublin recommendations will be:

Alleviation of Poverty and Disease

At the start of the 1990s, more than a quarter of the world's population still lack the basic human needs of enough food to eat, a clean water supply and hygienic means of sanitation. The Conference recommends that priority be given in water resources development and management to the accelerated provision of food, water and sanitation to these unserved millions.

Protection against natural disasters

Lack of preparedness, often aggravated by lack of data, means that droughts and floods take a huge toll in deaths, misery and economic loss. Economic losses from natural disasters, including floods and droughts, increased three-fold between the 1960s and the 1980s. Development is being set back for years in some developing countries, because investments have not been made in basic data collection and disaster preparedness. Projected climate change and rising sea levels will intensify the risk for some, while also threatening the apparent security of existing water resources.

Damages and loss of life from floods and droughts can be drastically reduced by the disaster preparedness actions recommended in the Dublin Conference Report.

Water Conservation and Reuse

Current patterns of water use involve excessive waste. There is great scope for water savings in agriculture, in industry and in domestic water supplies.

Irrigated agriculture accounts for about 80% of water withdrawals in the world. In many irrigation schemes, up to 60% of this water is lost on its way from the source to the plant. More efficient irrigation practices will lead to substantial freshwater savings.

Recycling could reduce the consumption of many industrial consumers by 50% or more, with the additional benefit of reduced pollution. Application of the "polluter pays" principle and realistic water pricing will encourage conservation and reuse. On average, 36% of the water produced by urban water utilities in developing countries is "unaccounted for". Better management could reduce these costly losses.

Combined savings in agriculture, industry and domestic water supplies could significantly defer investment in costly new water resource development and have enormous impact on the sustainability of future supplies. More savings will come from multiple use of water. Compliance with effective discharge standards, based on new water protection objectives, will enable successive downstream consumers to reuse water which presently is too contaminated after the first use.

Sustainable Urban Development

The sustainability of urban growth is threatened by curtailment of the copious supplies of cheap water, as a result of the depletion and degradation caused by past profligacy. After a generation or more of excessive water use and reckless discharge of municipal and industrial wastes, the situation in the majority of the world's major cities is appalling and getting worse. As water scarcity and pollution force development of ever more distant sources, marginal costs of meeting fresh demands are growing rapidly. Future guaranteed supplies must be based on appropriate water charges and discharge controls. Residual contamination of land and water can no longer be seen as a reasonable trade-off for the jobs and prosperity brought by industrial growth.

Agricultural Production and Rural Water Supply

Achieving food security is a high priority in many countries, and agriculture must not only provide food for rising populations, but also save water for other uses. The challenge is to develop and apply water-saving technology and management methods, and, through capacity building, enable communities to introduce institutions and incentives for the rural population to adopt new approaches, for both rainfed and irrigated agriculture. The rural population must also have better access to a potable water supply and to sanitation services. It is an immense task, but not an impossible one, provided appropriate policies and programmes are adopted at all levels - local, national and international.

Protecting Aquatic Ecosystems

Water is a vital part of the environment and a home for many forms of life on which the well-being of humans ultimately depends. Disruption of flows has reduced the productivity of many such ecosystems, devastated fisheries, agriculture and grazing, and marginalized the rural communities which rely on these. Various kinds of pollution, including transboundary pollution, exacerbate these problems, degrade water supplies, require more expensive water treatment, destroy aquatic fauna, and deny recreation opportunities.

Integrated management of river basins provides the opportunity to safeguard aquatic ecosystems, and make their benefits available to society on a sustainable basis.

Resolving Water Conflicts

The most appropriate geographical entity for the planning and management of water resources is the river basin, including surface and groundwater. Ideally, the effective integrated planning and development of transboundary river or lake basins has similar institutional requirements to a basin entirely within one country. The essential function of existing international basin organizations is one of reconciling and harmonizing the interests of riparian countries, monitoring water quantity and quality, development of concerted action programmes, exchange of information, and enforcing agreements.

In the coming decades, management of international watersheds will greatly increase in importance. A high priority should therefore be given to the preparation and implementation of integrated management plans, endorsed by all affected governments and backed by international agreements.

THE ENABLING ENVIRONMENT

Implementation of action programmes for Water and Sustainable Development will require a substantial investment, not only in the capital projects concerned, but, crucially, in building the capacity of people and institutions to plan and implement those projects.

The Knowledge Base

Measurement of components of the water cycle, in quantity and quality, and of other characterisitics of the environment affecting water are an essential basis for undertaking effective water management. Research and analysis techniques, applied on an interdisciplinary basis, permit the understanding of these data and their application to many uses.

With the threat of global warming due to increasing greenhouse gas concentrations in the atmosphere, the need for measurements and data exchange on the hydrological cycle on a global scale is evident. The data are required to understand both the world's climate system and the potential impacts on water resources of climate change and sea level rise. All countries must participate and, where necessary, be assisted to take part in the global monitoring, the study of the effects and the development of appropriate response strategies.

Capacity Building

All actions identified in the Dublin Conference Report require well-trained and qualified personnel. Countries should identify, as part of national development plans, training needs for water resources assessment and management, and take steps internally and, if necessary with technical co-operation agencies, to provide the required training, and working conditions which help to retain the trained personnel.

Governments must also assess their capacity to equip their water and other specialists to implement the full range of activities for integrated water resources management. This requires provision of an enabling environment in terms of institutional and legal arrangements, including those for effective water demand management.

Awareness raising is a vital part of a participatory approach to water resources management. Information, education and communication support programmes must be an integral part of the development process.

FOLLOW-UP

Experience has shown that progress towards implementing the actions and achieving the goals of water programmes requires follow-up mechanisms for periodic assessments at national and international levels.

In the framework of the follow-up procedures developed by UNCED for Agenda 21, all Governments should initiate periodic assessments of progress. At the international level, United Nations institutions concerned with water should be strengthened to undertake the assessment and follow-up process. In addition, to involve private institutions, regional and non-governmental organisations along with all interested governments in the assessment and follow-up, the Conference proposes, for consideration by UNCED, a world water forum or council to which all such groups could adhere.

It is proposed that the first full assessment on implementation of the recommended programme should be undertaken by the year 2000.

UNCED is urged to consider the financial requirements for water-related programmes, in accordance with the above principles, in the funding for implementation of Agenda 21. Such considerations must include realistic targets for the timeframe for implementation of the programmes, the internal and external resources needed, and the means of mobilizing these.

The International Conference on Water and the Environment began with a Water Ceremony in which children from all parts of the world made a moving plea to the assembled experts to play their part in preserving precious water resources for future generations.

In transmitting this Dublin Statement to a world audience, the Conference participants urge all those involved in the development and management of our water resources to allow the message of those children to direct their future actions.

ANNEX II

International Conference on Water and the Environment:

Development issues for the 21st century

26-31 January 1992, Dublin, Ireland

REPORT OF THE CONFERENCE

TABLE OF CONTENTS

1. INTRODUCTION

2. INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT

3. WATER RESOURCES ASSESSMENT AND IMPACTS OF CLIMATE CHANGE ON WATER RESOURCES

4. PROTECTION OF WATER RESOURCES, WATER QUALITY AND AQUATIC ECOSYSTEMS

5. WATER AND SUSTAINABLE URBAN DEVELOPMENT AND DRINKING WATER SUPPLY AND SANITATION IN THE URBAN CONTEXT

6. WATER FOR SUSTAINABLE FOOD PRODUCTION AND RURAL DEVELOPMENT AND DRINKING WATER SUPPLY AND SANITATION IN THE RURAL CONTEXT

7. MECHANISMS FOR IMPLEMENTATION AND CO-ORDINATION AT INTERNATIONAL, NATIONAL AND LOCAL LEVELS

8. OPTIONS FOR FOLLOW-UP

1. INTRODUCTION

1.1 The International Conference on Water and the Environment was convened in Dublin, Ireland, from 26 to 31 January 1992. The Conference was attended by five hundred participants, including government-designated experts from a hundred countries and representatives of eighty international, intergovernmental and non-governmental organizations. The list of participants is contained in Annex I of the report.

1.2 The Conference was opened by His Excellency Mr. Charles Haughey, Prime Minister of Ireland, who welcomed the participants on behalf of his Government, and highlighted the seriousness of the problem of water availability to sustain human life, support economic development and maintain ecosystems. Professor Godwin Obasi, Secretary-General of the World Meteorological Organization, Dr. Mustafa Tolba, Executive Director of the United Nations Environment Programme, and Dr. Arcot Ramachandran, Executive Director of the United Nations Centre for Human Settlements welcomed the participants on behalf of the Organizations of the United Nations system. The opening session was addressed by His Excellency Dr. Rory O'Hanlon, Minister for Environment and by His Excellency Mr. Carlos Borrego, Minister for the Environment and Natural Resources of Portugal on behalf of the European Community.

1.3 Mr. James Dooge (Ireland) was elected Chairman of the Conference and Ms. Claudia Candanedo (Panama) was elected Rapporteur. Messrs Abbas Hidaytalla Abdullah (Sudan), James Bruce (Canada), Odon Starosolszky (Hungary), Jose Luis Calderón (Mexico), Chandra Sharma (Nepal), and Mahmoud Abou-Zeid (Egypt) were elected vice chairmen of the Conference. The programme of work for the Conference is contained in Annex II of the report.

1.4 The Vice-chairmen of the Conference acted respectively as chairmen of the working groups on: Integrated Water Resources Development and Management (working group A), Mechanisms for Implementation and Co-ordination at the International, National and Local Levels (working group B), Water Resources Assessment and Impacts of Climate Change on Water Resources (working group C), Protection of Water Resources, Water Quality and Aquatic Ecosystems (working group D), Water and Sustainable Urban Development and Drinking Water Supply and Sanitation in the Urban Context (working group E), and Water for Sustainable Food Production and Rural Development and for Drinking Water Supply and Sanitation in the Rural Context (working group F). Mr. Mohamed Abdulrazzak (Saudi Arabia) was elected as Vice-Chairman for working group A, and Mr. Ainun Nishat (Bangladesh) as Rappporteur. Mr. Mohammed Jellali (Morocco) was elected as Vice-Chairman of working group B, and Mr. Abdul Karim Al-Fusail (Yemen) as Rapporteur. Mr. Karl Hofius (Germany) was elected as Vice-Chairman of working group C, and Mr. Moremi Sekwale (Botswana) as Rapporteur. Mr. Ivan Zavadsky (Czechoslovakia) was elected as Vice-Chairman of working group D, and Ms. LaJuana Wilcher (United States of America) as Rapporteur. Mr. Gabriel Arduino (Uruguay) was elected Vice-Chairman of working group E, and Ms. Ebele Okeke (Nigeria) as Rapporteur. Mr. David Constable (Australia) was elected Vice-Chairman of working group F, and Mr. Mario Fuschini-Mejía (Argentina) as Rappporteur.

1.5 The main focus of the Conference was on the development, management and utilization of water resources in harmony with environmental conservation and the concept of sustainability. The latter concept indicates the need to promote:

(a) The synthesis of economic, social and environmental considerations.

(b) Processes which compare and evaluate alternatives which do not deplete the resource base and thus not affect present and future generations.

(c) The greatest possible efficiency in the use of water and energy, including appropriate and safe reuse, recycling, and conservation of all water resources.

(d) Reduction of pollutants and pathogens in water and aquatic ecosystems.

(e) The quality of human life and the protection of the biosphere.

(f) Flood and drought preparedness systems as an integral part of the concept of sustainability and economic development.

1.6 The concept of sustainability also recognizes the interrelation with other natural resources. This requires an explicit understanding of the role played by ecosystems in maintaining the quality and quantity of freshwater resources, and the reciprocal dependence of natural aquatic ecosystems on the maintenance of adequate freshwater flows.

1.7 The Conference further recognizes the central role of women in the provision, management and safeguarding of water, and that every human being has the right of reasonable access to clean water and sanitation.

1.8 As we rapidly approach the twenty-first century, it is apparent that throughout the world, management of our freshwater resources must change to meet the goal of sustainable development. The Conference was the first major meeting of world experts to focus on the holistic management of water in its proper context, that is, in the integrated spectrum of human and environmental uses and needs, as opposed to particular sectoral needs.

1.9 Development has stressed freshwater ecosystems. Human consumption, industrial and agricultural production, and the modification of freshwater systems to support this development have resulted in the diminution or loss of many aquatic species, and habitat degradation. These losses, in turn, have adversely affected human health and development as fisheries, wildlife, flood protection and overall water quality have declined. To achieve long term, sustainable development, such adverse environmental effects must be avoided. Sustainable water resource development is development that promotes the quality of human existence and the natural functions of the biosphere.

1.10 The Report of the Conference and the Dublin Statement were adopted by consensus. In the case of a few paragraphs, the extent of the consensus was determined by a show of hands.

1.11 The participants at the Conference recognized the need for fundamental new approaches to development and management which can only be brought about through political commitment and involvement from the highest levels of government to the smallest communities. The participants, through the world leaders assembled at the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992, urge all governments to study and undertake the specific activities and means of implementation recommended in the body of this report, and to translate its recommendations into urgent programmes for WATER AND SUSTAINABLE DEVELOPMENT.

2. INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT

Principles

2.1 These findings are drawn from the large and diversified experience gained among all countries since the United Nations Water Conference, Mar del Plata 1977. They identify some serious errors and unwise biases, and at the same time point to numerous fruitful advances in understanding and action. We look to the future with humility and greater confidence. There emerged four main principles that need to be applied in taking action to achieve integrated water resources development and management.

2.2 The first principle is that since water sustains all life forms, a holistic approach is needed for the development of human societies and economies, and the protection of natural ecosystems on which the survival of humanity ultimately depends. This includes not only the need to look at the whole water cycle (including the distribution of rainfall, the conservation of sources, the systems of supply and waste-water treatment, and the interaction with the natural environment and land use), but also the inter-sectoral needs. It must also include an ecological approach, respect existing ecosystems and consider issues across the whole of a river basin or a groundwater aquifer and also consider the interrelation with other natural resources. Where catchments cross national boundaries, international cooperation is essential.

2.3 The second principle is the need for a participatory approach in institutions and arrangements for water development and management. This also has implications for training and education. A participatory approach requires:

- the participation of beneficiaries (water users) and the public, with particular emphasis on the involvement of women in planning, implementing and evaluating water projects;

- raising awareness of the importance of water among policy-makers and the general public;

- public consultation;

- decisions at the lowest appropriate level, in order to bring decision-making as close as possible to those affected.

2.4 The third principle is the need to recognize the central role of women in the provision, management and safeguarding of water, which has seldom been given sufficient prominence.

2.5 The fourth principle is the recognition that water has an economic value and, therefore, should be considered as an economic good. In evaluating such a good, it is essential to ensure that proper regard is paid to:

- the importance of water to society, which requires that everyone, particularly women and the underprivileged, should have a right of reasonable access at an affordable price;

- sustainable development;

- demand management for efficient and equitable resource use;

- environmental factors, to ensure that external costs and benefits are properly included;

- financial viability and accountability.

Actions

2.6 To give effect to these principles, a number of actions were identified which will involve multilateral and bilateral co-operation.

Capacity building

Information base and know-how

2.7 Adequate and comparable information is essential for sound decisions. The Conference identified the need for every institution taking decisions in this field and for the public to have the best feasible access to:

- information on water resources, both surface water and ground water, quantity and quality;
- water use data and information for those concerned in, or affected by, that water and their likely development and demands;
- social and economic data;
- information on the natural environment.

This may involve co-ordination of existing data bases. Continued scientific and technological research and the sharing and dissemination of know-how is also essential.

2.8 These data need to be validated, kept up-to-date and to be accompanied with evaluations and assessments, in order to analyse the effects of decisions based upon them. Only in this way can the development and management of the water resources be made responsive to demands and be enabled to influence the way in which those demands develop.

Human resources development

2.9 To implement these principles, communities need to have adequate capacities. Those who establish the framework for water development and management at any level, whether international, national or local need to ensure that the means exist to build those capacities.

2.10 These means will vary from case to case. They usually include:

- awareness-creation programmes including mobilizing commitment and support at all levels and initiating global and local action to promote such programmes;
- the training of water managers at all levels so that they have an appropriate understanding of all the elements necessary for their decisions;
- the strengthening of training capacities in developing countries;
- appropriate training of the necessary professionals including extension workers;
- improvement of career structures;
- sharing of appropriate knowledge and technology, both for the collection of data and for the implementation of planned development; this should include non-polluting technologies and the knowledge needed to extract the best performance from existing investment and systems;

Public awareness

2.11 To promote the general education of the public about the proper use of water and its economic value, the factors which need to be taken into account and the methods by which decisions are taken with full public participation.

Institutional and legal arrangements

2.12 *Management at the lowest appropriate level:* Recognizing the need for a central mechanism capable of ensuring co-ordination of national social and economic interests, the role of governments needs to be reviewed to ensure that users, local institutions and the formal and informal private sector can play a more direct part. A key aim must be to improve accountability to the public. The levels at which management decisions can be taken and problems solved will vary widely from country to country and case to case. In any given situation, however, water resources should be managed at the lowest appropriate levels. Integrated water resources development and management therefore should be delegated to those lowest appropriate levels which would ensure the representation of those concerned or affected and integration of sectoral demands. These may be existing bodies, institutions and mechanisms or special river basin authorities. Consistent with such institutional structures is a greater reliance on incentives, prices and markets and less reliance on traditional command and control approaches.

2.13 *National level*: Higher management levels and the national level will play a very important role in ensuring the availability of the information, co-ordination, policy development, planning, the legal framework, and the development of human resources, which are all needed for integrated water resources development and management , including sector integration. In many cases there will be a need to identify a national administrative unit for effective co-ordination, which should preferably not be a water user.

2.14 *International level*: In many cases, the integrated water resources development and management of transboundary water resources will raise the need for international co-operation and mechanisms at international or regional levels to facilitate inter-country agreement on the co-ordination of the management of such resources in an economically and environmentally sound manner. A coherent approach by all international organizations is also needed.

2.15 *Law*: The national legal framework for integrated water resources development and management decisions need to be clear and be consistent with the above principles. International law is needed to facilitate bilateral or regional agreements on transboundary integrated water resources development and management. In this context, an international seminar should be organized as soon as possible, to examine the legal aspects of integrated water resources development and management at international, national and local levels.

Implementation Considerations:

2.16 *Planning*: Water resources development and management should be planned in an integrated manner, taking into account long-term planning needs as well as shorter horizons, i.e. it should incorporate environmental, economic and social considerations based on the principle of sustainability; it should include the requirements of all users as well as those relating to the prevention and mitigation of water-related hazards; and it should be an integral part of the socio-economic development planning process. A prerequisite for sustainable management of water as a scarce and vulnerable resource is that its full costs should be acknowledged in all planning and development. Planning considerations should reflect benefits investment, environmental protection and operation costs, as well as the opportunity costs reflecting the most valuable alternative use of water. Actual charging need not necessarily burden all beneficiaries with these. Charging mechanisms should, however, reflect as far as possible both the true cost of water when used as an economic good and the ability of the communities to pay.

2.17 *Demand-management*: The role of water as an economic and life-sustaining good should be reflected in demand management mechanisms, implemented through:

- water conservation and re-use;
- resource assessment;
- financial instruments;

- impact monitoring.

2.18 *Finance*: In all this, it will be necessary to consider the sources and methods of financing. Local, national and external sources of finance, public and private, will need to be mobilized.

2.19 *Investment*: The setting of priorities afresh for private and public investment strategies should take place taking into account:

- maximum utilization of existing projects, through maintenance, rehabilitation and optimal operation;

- new or alternative clean technologies;

- environmentally and socially benign hydro-power.

2.20 It is necessary to ensure consultation among all parties involved prior to approval for funding of any water-related United Nations project or programme.

2.21 Appropriate mechanisms must be found to correct the negative effects of structural adjustment in depriving the poor of their right of access to drinking water.

3. WATER RESOURCES ASSESSMENT AND IMPACTS OF CLIMATE CHANGE ON WATER RESOURCES

Introduction

3.1 Water resources assessment is the determination of the quantity, quality and availability of water resources, on which is based an evaluation of the possibilities for their sustainable development, management and control.

3.2 Water resources assessment is a prerequisite for sustainable development and management of the world's water resources. It provides the basis for the vast range of activities where water is involved. Without detailed water resources assessment it is impossible properly to plan, design, construct, operate and maintain projects for irrigation and drainage; mitigation of flood losses; industrial and domestic water supply; urban drainage; energy production (including hydropower); health; agriculture; fisheries; drought mitigation and the preservation of aquatic ecosystems and coastal waters.

3.3 The nature of the decisions based on water resources assessment information may involve major capital investments with potentially massive environmental impacts. This demonstrates the value of water resources assessment activities, and their tangible and intangible benefits. Appropriate government policies and programmes are necessary to ensure sustainable development for the future. Thus there is a need for greater knowledge about the quantity and quality of surface and groundwater resources and for comprehensive monitoring to guide the management of these resources.

Institutional and Financial Framework in Support of Water Resources Assessment

3.4 The assessment of the water resources of a country is a national responsibility and the activities concerned should be designed to meet the specific needs of the country. Many of its component activities may be undertaken at local and provincial level. This national responsibility should be shared among neighbouring countries in the case of transboundary water resources, and international programmes and projects can provide valuable assistance.

3.5 Given the importance of assessment information to support sustainable development and the maintenance of ecosystem integrity, all countries are urged to achieve a level of water resources assessment activity appropriate to their needs as soon as is practicable.

3.6 Policy should be that all national and international water resources assessment activities are fully co-ordinated and funded on a long-term basis. The approach taken to achieve this may differ from country to country, but it will usually involve the establishment of regulations and a series of administrative decisions, particularly on the allocation of funds.

3.7 Water resources assessment requires considerable financial resources if it is to provide the support to sustainable socio-economic development These resources, however, represent only a small fraction (say 0.2 to 1.0%) of the funds spent on investment and operations in the water sector as a whole. Governments are urged to put priority on water resources assessment activities when allocating national and international funds.

3.8 Recommended actions include:

(a) Defining the information needs of users and establishing a national policy, a legislative framework, efficient institutional structures and economic instruments appropriate for water resources assessment.

(b) Establishing and maintaining effective co-operation in water resources assessment and hydrological forecasting activities between national agencies within a country, and between countries with regard to transboundary water resources.

(c) Encouraging those responsible for collecting and storing data to apply the methodologies that have been developed and endorsed at the international level when evaluating their water resources assessment activities.

(d) Developing and disseminating information on means of estimating benefits and costs of water resources assessment activities and assisting national services to demonstrate the benefits of water resources assessment.

(e) Making practical and legislative provisions for the long-term sustainability of water resources assessment and forecasting activities, and allocating the necessary financial resources, especially in the case of developing countries.

Collection and storage of water-related information

3.9 Reliable information on the condition and trends of a country's water resources - surface water, water in the unsaturated zone and groundwater, quantity and quality - is required for a number of purposes, such as: assessing the resource and its potential for supplying the current and foreseeable demand; protecting people and property against water-related hazards; planning, designing and operating water projects; and monitoring the response of water bodies to anthropogenic influences, to climate variability and change, and to other environmental factors.

3.10 Integrated monitoring and information systems should be established and data collected and stored on all aspects of water resources which are required for a full comprehension of the nature of those resources and for their sustainable development. These include not only hydrological data, but also related geological, climatological, hydrobiological and topographic data and data on soil types, land use, desertification and deforestation, as well as information on such topics as water use and re-use, sewage discharges, point and non-point sources of pollution and runoff to seas and oceans. This involves the installation of observation networks and other data gathering mechanisms designed to monitor various climatic and topographic regimes, plus the development of data storage facilities. Where, at national, regional and international levels, water-related information is handled by a number of information systems, it is important that these systems be co-ordinated.

3.11 Recommended actions include:

(a) Installing monitoring systems designed to provide valid and comparable water-related information.

(b) Ensuring the continuous operation of such systems in support of studies requiring long-term data, such as those relating to climate change.

(c) Upgrading facilities and procedures for storing, validating and safeguarding such data.

(d) Implementing techniques for processing such data and assimilating related information.

(e) Comparing, selecting and applying hydrological technology appropriate to each country's needs and ensuring the transfer of appropriate technology, particularly between hydrological services.

Assessment of the resource and dissemination of water information

3.12 Those who plan, design and operate water projects, and those who are concerned with the protection of life, property and the environment from natural or man-made disasters, should have access to the water-related information necessary for their work. They should be informed of the availability of such information and be able to obtain it in forms that are convenient for their use, including the free and urgent exchange of data required for mitigating natural disasters. Commercialization of water-related information should not prevent its full use, and dissemination of water-related information should be on a non-profit basis.

3.13 The approach is to assess the data and information needs of potential users and to match these with the services provided by information centres and forecasting systems. This includes the strengthening of existing global data bases and the call for countries to supply data to such bases. In this, increasing use will be made of geographic information systems and similar computer-based technology. One particular application of hydrological data is in the installation and operation of hydrological forecasting systems and related activities which are vital to safeguard lives and property in the face of major natural disasters.

3.14 Recommended actions include:

(a) Identifying the need for water-related data and analyzing and presenting such data in forms appropriate for planning and management of water resource development; and for other purposes such as studies of the impact of water development projects on the environment.

(b) Assembling and disseminating basin-wide, regional and global sets of water-related data and information for use, *inter alia*, in the management of resources within international river basins and in climate change studies.

(c) Assessing surface water and groundwater resources and the interactions between surface water and groundwater.

(d) Assessing the risk of flooding from rainfall runoff, snowmelt, storm surges and land-slides and installing hydrological forecasting and warning systems for areas subject to such risk.

(e) Assessing the risk of drought and installing drought warning systems in support of schemes to mitigate the effects of drought.

(f) Dissemination of these assessments to all requiring the information, and assuring the incorporation of water resource information in decision making processes.

Research and development in the water sciences

3.15 Water resources assessment, including studies of flooding, drought and desertification, and hydrological forecasting should be based on a sound understanding of the scientific principals involved and are dependant on technology for their implementation. Research and development activities should therefore be based on a strategic analysis of the very varied needs of countries. They should take account of, and strengthen indigenous expertise.

3.16 Recommended actions include:

(a) Establishing and strengthening research and development programmes appropriate to the needs of countries so as to increase understanding of the fundamental processes involved in the water cycle, including the interactions between water, land and the atmosphere, and to support water resources assessment and hydrological forecasting activities.

(b) Promoting the development of new technology for water resources assessment and hydrological forecasting, making full use of local expertise in this regard.

(c) Transferring appropriate technology to users.

(d) Strengthening relevant international and regional programmes both at national and global levels.

Impact of climate change and variability on freshwater resources and the hydrological cycle

3.17 Among the most important impacts of climate change will be its effects on the hydrological cycle and water management systems, and through these on socio-economic systems. Therefore, there is a need to acquire an adequate understanding of the potential impact of the predicted climate change on the availability and reliability of freshwater resources, on water demand, on the incidence of floods and droughts and on the consequences for the efficient management and safety of existing and future water-related projects and structures. This will permit the planning and implementation of effective counter-measures in the case of deleterious consequences and revised policies in the event of beneficial consequences. Efforts should be directed through both national and international programmes involving comprehensive monitoring, research and policy-review. Water-related data are therefore essential for studies related to climate change and variability.

3.18 Recommended actions include:

(a) Increasing the co-operation between climatological and hydrological communities in developing predictions of climate change for individual seasons and for specific regions.

(b) Strengthening capabilities to collect, store and process water-related data, including data related to climate change.

(c) Developing research programmes at national level and contributing to regional and international research projects on the question of climate change, its early detection and its impact on the hydrological regime. These should address the situation in developing as well as developed countries and could involve case studies designed to develop and test specific methodologies for impact assessment.

(d) Assessing the likely socio-economic and environmental impacts of such changes, developing response strategies and funding and implementing these strategies.

Impact of a sea-level rise resulting from climate change

3.19 Assessments should be made in all coastal zones and in particular in low-lying islands of the potential impact of any rise in sea-level resulting from climate change. This impact may be on the quality and quantity of freshwater resources or on the risk of flooding.

3.20 Recommended actions include:

(a) Strengthening capabilities to monitor rises in sea-level and related hydrological parameters.

(b) Developing techniques for assessing the potential impact of a sea-level rise on freshwater resources and flood risk.

(c) Assessing the likely socio-economic and environmental impacts of a rise in sea-level, developing response strategies and funding and implementing such strategies.

Human resources development

3.21 Salaries and wages commonly account for half or more of the expenditure of an effective programme for water resources assessment and hydrological forecasting. Because people are the most important resource available to the manager of such a programme, personnel matters should receive great attention. The aim should be to attract and retain personnel to work on water resources assessment who are sufficient in number and adequate in their level of education to ensure the effective implementation of the activities that are planned. Education may be called for at both national and international level, while adequate terms of employment are a national responsibility.

3.22 Recommended actions include:

(a) Identifying education and training needs geared to the specific requirements of countries.

(b) Establishing and strengthening education and training programmes on water-related topics, within an environmental and developmental context, for all categories of staff involved in water resources assessment activities, using advanced educational technology where appropriate and involving both men and women.

(c) Developing sound recruitment, personnel and pay policies for staff of national and local water agencies.

4. PROTECTION OF WATER RESOURCES, WATER QUALITY AND AQUATIC ECOSYSTEMS

Introduction

4.1 Fresh water is a unitary resource. Long-term sustainable development of global fresh water requires holistic management of the resource and recognition of the inter-connectedness of the elements that comprise fresh water and impact its quality. Groundwater and surface water quality are inextricably linked. There is a growing recognition that issues of water quality cannot be considered separate from water quantity. The traditional emphasis on chemical indicators of water quality must be supplemented by more comprehensive indicators based on the total properties of a waterbody, including chemical, physical, biological, and ecological parameters. It must also be recognized that fresh water quality is impacted directly by natural and human activities outside the water sphere, such as land-use practices, erosion, and deforestation. Certain water quality problems are tied to acid deposition or natural contamination. Such problems often require monitoring and protection at the local level, while some have significant transboundary components which can be addressed only at the national and international level. All in all, the complex inter-connected nature of the fresh water system demands that fresh water management be holistic rather than piece-meal, systematically based rather than micro-managed, and based on a balanced consideration of the total needs of people and the environment.

Water Resources Protection and Conservation

4.2 Growing demands for water have brought increased pressures on finite supplies. An ecosystem approach is necessary to provide adequate quantities and qualities of water to all users and to protect ecosystem integrity over the long term.

4.3 There is a widespread lack of perception of the linkages between the development, management, use and treatment of water resources and aquatic ecosystems. A preventive approach is crucial to avoid costly subsequent measures to rehabilitate, treat and develop new water supplies.

4.4 By the year 2000 all countries, appropriate to their capacities, available resources and needs, and with the help of external support agencies, as appropriate, should have identified those surface and groundwater resources which could be developed for use on a sustainable basis and other major water dependent resources which can be developed. Simultaneously they should have initiated programmes for the protection, conservation and rational use of these resources on a sustainable basis.

4.5 Recommended actions include:

(a) Preparation of basin action plans, especially for priority high risk basins, including their rivers, lakes, and aquifers, designated at the national level (and at international levels, for those basins that transcend international boundaries), to integrate land-use planning with water management and conservation, to coordinate the activities of provincial, national and international agencies, to address transboundary issues, and to initiate contingency plans to control accidental spills and to respond to natural disasters.

(b) Establishment of appropriate legislation, enforcement and economic mechanisms for water resources protection and conservation at the national level with international co-operation to promote water conservation and recycling, pollution prevention and control, and environmentally-sound agricultural and industrial practices.

(c) Establishment of permanent, multi-sectoral planning and environmental impact assessment processes for water resources development and management covering hydrological, ecological, social, health, economic and meteorological aspects. These planning and evaluation processes should be used at the national and international levels in government agencies and external support agencies. External support agencies should include these processes in their action programmes.

(d) Development and application of water quality and water supply criteria for ecosystems and health protection to be implemented at local, provincial, national and international levels.

Monitoring and Surveillance of Water Resources

4.6 Monitoring, assessment and prediction of the quality and quantity of rivers, lakes and groundwaters through water, biota and sediment is a goal, whenever possible, for sound water resources management and protection. In addition to providing wildlife habitat, protecting and improving water quality and providing flood protection, aquatic systems are also linked to all other environmental components, and are therefore a powerful indicator of the overall environmental quality. Exact, complete and precise water quality data are needed from the local level to the international level for transboundary water bodies, and to the global scale where rivers provide a major input of pollutants to seas and oceans.

4.7 By the year 2000 all countries should have established appropriate assessment programmes of their water resources, and should participate in regional (e.g. basin level) and international water quality and quantity assessments. These efforts should be matched to their capacities, available resources and needs, and assisted by external support agencies, as appropriate.

4.8 Recommended actions include:

(a) Establishment of purpose-oriented water assessments and predictions taking into account the specificity of both surface and ground waters, water quality and water quantity and addressing all pollution types.

(b) Establishment and enhancement of effective flood and drought warning and preparedness systems within the framework of the International Decade for Natural Disaster Reduction.

(c) On a basin scale, or as appropriate on a larger scale, the assessments should be harmonized (station networks, field and laboratory techniques, methodologies and procedures, data handling), leading to basin-wide data systems which should be made accessible to the relevant institutions and to the public. These assessments should be made available through adequate international cooperation within all basin countries.

(d) Training programmes developed throughout the monitoring chain from field activities and laboratory practices to data interpretation, and reporting are a key component from the local to national level. Analytical quality control and inter-laboratory comparisons are needed to ensure proper comparisons within basins and at an international level (e.g. pollutant inputs to seas and oceans). This should be achieved through the creation or enhancement of national or regional reference laboratories and observatories. The establishment of national or regional water quality centres is needed, as well as surveillance centers to evaluate the health of aquatic ecosystems.

(e) New appropriate assessment and prediction techniques and methodologies should be developed and used, such as low-cost field measurements, continuous and automatic monitoring, use of biota and sediment for micro-pollution, remote sensing and geographic information systems.

Water Pollution Prevention and Control

4.9 A water pollution prevention and control strategy should 1) maintain ecosystem integrity through the protection of aquatic resources from negative impacts caused by development and natural processes, 2) protect public health against disease vectors and from pathogens, and 3) ensure sustainable water use and ecosystem protection on a long-term basis.

4.10 In order to slow down the rapid deterioration of water quality and enhance the availability of safe water, by the year 2000 all countries, appropriate to their capacities, the availability of resources

and needs, and with the support of external support agencies, as appropriate, should have in place water pollution control programmes based upon enforceable standards for major point-source discharges, as well as major nonpoint sources of pollution. These should include an inventory of potential sources of water supply leading to the preparation and implementation of programmes for their protection, conservation and sustainable utilization.

4.11 Recommended actions include:

(a) Development and application of rapid assessment procedures for the identification, inventorization and quantification of pollution sources; effluent monitoring; monitoring of acid precipitation; industrial and municipal sector reviews; and agrochemical use verification.

(b) Development of programmes in priority areas of high risk for the restoration and enhancement of degraded aquatic ecosystems, including water courses, lakes and groundwater aquifers.

(c) Promotion of national legislation and regional agreements, where necessary, for preventing and controlling transboundary water pollution.

(d) Through capacity building of regulatory agencies, at all levels, strengthen the enforcement of pollution prevention and control measures.

(e) Where possible, utilize economic instruments, including charges on water users and polluters and appropriate incentives, with the funds generated being utilized for waste water treatment and reinforcement of environmental management activities in freshwater resources.

(f) Development and application of appropriate, low-cost, low-waste industrial production and sewage treatment technology, appropriate technology for the recycling of wastewater, biotechnology for waste treatment and indigenous technologies for water pollution prevention and control.

(g) Establishment of a national surveillance programme for the operation and maintenance of water pollution control installations, with particular attention to high risk zones, with the possible aid of international agencies.

(h) Protection of public health by the development of programmes for the identification and control of disease vectors and pathogens transmitted through freshwater.

Protection of Groundwater

4.12 The extent and severity of contamination of unsaturated zones and aquifers has long been underestimated due to the relative inaccessibility of aquifers and the lack of reliable information on aquifer systems. A strategy for the protection of groundwater must be aimed at protecting aquifers from becoming contaminated and preventative efforts should be directed first at land-use activities and point and nonpoint sources that pose a high-risk of causing pollution. Care must be exercised to avoid groundwater development that leads to the degradation of groundwater quality or the depletion of groundwater supplies. By the year 2000 assessments of known aquifers and their vulnerability to contamination should have commenced in all countries, while potential sources of groundwater pollution should be identified and plans for their control developed. These activities should be matched to the capacities, available resources and needs of countries and undertaken with the help of external support agencies, as appropriate.

4.13 Recommended actions include:

(a) Implementation of mapping programmes for identification of aquifer recharge areas, establishment of national inventories of known groundwater resources and the characterization of aquifers and determination of their responses to groundwater development activities . Such aquifer information will permit water managers to identify recharge and abstraction areas and interactions between surface waters and aquifers and establish controls on the types of activities which take place in these zones.

(b) Identification and control of major pollution sources. These include on-site sewage discharges, active and inactive landfills, mine tailings and mine drainage among others.

(c) Promotion of conservation, environmentally sound cultivation practices, appropriate use of fertilizers and pesticides, and proper management of animal manure and farm effluents to minimize groundwater and surface water contamination.

(d) Prevention of saline intrusion into aquifers through careful management of abstraction rates, and where appropriate artificial recharge.

(e) Encouragement and development of technologies for the promotion of waste minimization, pre-treatment and recycling.

(f) Ensure that resource management and legislation provides for the sustainable management of groundwater, and promote the development of national legislation for protecting groundwater.

Protection of Aquatic Ecosystems and Freshwater Living Resources

4.14 An integrated approach to environmentally sustainable management of the water resources needs to include protection of aquatic ecosystems and freshwater living resources as a central goal. Living resources within aquatic ecosystems should be managed to optimize the benefits for human needs and the long-term sustainability of the ecosystem. By the year 2000 all countries should put in place strategies for the environmentally sound management of their freshwater and associated coastal ecosystems; such strategies should consider fisheries, aquaculture, grazing, agricultural resources and biodiversity. These resources add to the value of water as an economic good and in return provide powerful justification for the protection of these ecosystems. These activities should be undertaken by countries according to their capacities, available resources and needs, and with the support of external support agencies, as appropriate.

4.15 Recommended actions include:

(a) Plan and implement environmentally sound management of aquatic and terrestrial ecosystems including catchment and riparian forests, wetlands, riverine floodplains and associated freshwater and estuarine habitats as integral components of comprehensive water resources development.

(b) Mandate environmental impact assessments for all major projects in basins considering social, health, economic and ecological concerns.

(c) Maintain, and where appropriate, restore or enhance the ecological productivity and diversity of the wetland ecosystems which are important for their social, economic and environmental values.

(d) Contracting parties to the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (RAMSAR Convention) are urged to apply its provisions in support of the environmentally protective recommendations identified here and to encourage non-contracting parties to join in the convention.

Summary and Recommendations

4.16 Water should be managed and developed holistically, in view of critical natural connections. This means management on a drainage basin basis, including transboundary basins, to ensure environmental protection and conservation of the natural resources base. Holistic water management means that all uses, including the conservation and sustainable use of living resources, are considered when making water management decisions. This objective will be more likely to be achieved if values, direct and indirect, obvious and intrinsic, are calculated and the true cost of water is paid by the user. The payment of the true cost of water is likely to encourage water conservation, efficiency and reuse. As recognized by the recent Mexico Declaration (1991), efficient water use and the reuse of waste water are the most cost effective and environmentally sound ways to address water-supply needs. The ability to pay of the poor urban and rural people should be considered in pricing water supplies for essential uses.

4.17 A basin approach to water resources planning and management means considering all sources of pollution, point and nonpoint, including acid deposition and the leaching of contaminants from the soil into groundwater. It means addressing the connections between surface water and groundwater. It means considering the relationship between water quality and water quantity, and between upstream and downstream uses. And it means protecting and, as appropriate, restoring the chemical, physical and biological characteristics of water systems.

4.18 Several approaches, tools and mechanisms are recommended to implement holistic basin management. As a general approach, preventing pollution through reduced loadings or better management practices is preferable, both economically and environmentally, to cleaning up water resources after they are fouled. Scientific research, analysis, monitoring, surveillance, predictions and assessments are important tools upon which to rely when making management or development decisions. Environmental, social, health, economic, technical and legal considerations all must be taken into account and applied in an appropriate balance when making management decisions and when implementing them.

4.19 Public information, education and participation are important parts of holistic basin management.

4.20 While many actions are local or provincial in nature, the ultimate impact on the environment is global. Accordingly, national leadership, supported by international co-operation in capacity building, training and technology transfer is important. An assessment of these issues and the global progress on implementing an environmentally sound basin management approach should be made by the year 2000.

4.21 To promote the holistic basin management approach, an action programme for the environmentally sound integrated management of basins should be established. Mechanisms within the United Nations system as a whole, as well as multilateral and bilateral cooperation agencies, should be called upon to support this initiative. Wherever applicable, existing regional bodies should be enlisted in supporting the implementation of the proposed initiative in international basins.

5. WATER AND SUSTAINABLE URBAN DEVELOPMENT AND DRINKING WATER SUPPLY AND SANITATION IN THE URBAN CONTEXT

Introduction

5.1 Urbanization and industrialization linked with rapid population growth have been major engines for national economic growth. These tendencies are expected to continue and, in some countries, to accelerate. Urban domestic and industrial consumers are using even larger shares of available water resources and are, at the same time, degrading these resources with their wastes. Urgent actions are required to improve the effectiveness of use of water resources, if their contribution to human well-being and productivity is to be sustained.

5.2 The Conference endorses three key strategic principles for setting priorities and choice of action programmes for the use and management of water resources:

- Water should be considered an economic good having a value consistent with its most valuable potential use.

- The above principle necessitates new institutional approaches to the management of water resources. Capacity building, especially institutional development, should therefore receive priority attention.

- In the choice of sectoral priorities for action programmes, relatively more attention should be given to the management of wastes (reduction, reuse and recycling, collection, treatment and disposal).

5.3 To prevent exaggerated expectations about the rate of progress which is possible in resolving important issues in implementing the above principles, action programmes should be consistent with realistic appraisal of the resources available to implement them, at the same time the international community should mobilize resources to support the proposed actions.

5.4 Six areas of particular concern are discussed in the following sections.

Institutional/Legal/Management Reforms

5.5 Water resources should be managed at the lowest appropriate level by institutions capable of managing water distribution and demand.

5.6 Urban water and sanitation services need to be integrated with land use, housing and environmental protection. As scarcity increases, water resources have a greater impact on development planning. Urban water resource management should, therefore, be integrated with all aspects of national and regional planning processes affecting the region in which the city is sited.

5.7 Financial viability and autonomy of urban water and sewerage agencies should be encouraged.

5.8 By the year 2000 all countries, appropriate to their capacities, available resources and needs, and with the support of external support agencies, as appropriate, should have arrangements for enforcing water and effluent standards which should reflect the "polluter pays" principle.

5.9 Recommended actions include:

(a) Initiate capacity building programmes to establish institutional and legislative frameworks for water management and pollution protection, especially for integrated water resources planning and land-use management; developing and applying regulatory and economic instruments; and undertaking monitoring and surveillance.

(b) Develop institutional frameworks which bring together water utilities, non-governmental organizations, the private sector and community groups to exchange views, contribute

skills and take decisions on water supply and sanitation projects. Support intersectoral planning involving relevant sectoral agencies at all administrative levels.

(c) Train and retain staff at all levels with skills in community involvement, low-cost technologies, and financial management and for undertaking hygiene education programmes, with a focus on women and children.

(d) Undertake international collaboration and information exchange in support of institutional reforms.

Efficient and Equitable Allocation of Water Resources

5.10 As demand grows and resources diminish, priorities have to be established which balance health improvement, desires for food security, environmental protection and economic growth. The economic, social and environmental priorities to be established should take into account the availability and long term sustainability of water resources ensuring, as a top priority, the availability of sufficient affordable domestic supplies, providing for meeting the basic needs of the very poor, particularly during droughts. Charging for water use is essential, and the full cost of any subsidies (including opportunity cost) should be public knowledge.

5.11 By the year 2000 planning processes should ensure that water resource and development objectives are matched, enabling cities to plan on an assured basis.

5.12 Recommended actions include:

(a) Provide technical and financial support at all levels for assessment and monitoring to help safeguard the availability and quality of surface and groundwater resources and reduce pollution load by sector.

(b) Inform public opinion and encourage Governments to develop priorities according to economic criteria for the allocation of water resources to achieve long term sustainability.

(c) Strengthen institutional capacity especially at the local level and provide technical support for the introduction and application of water charges and pollution penalties which reflect the marginal and opportunity cost of water.

(d) Foster water conservation and recycling through all available means including economic and regulatory incentives and technical devices. Provide incentives for efficient use of water, recycling and pollution reduction.

(e) Make available affordable supplies for meeting the basic needs of the poor who lack services at the present.

Protection Against Depletion and Degradation of Water Resources

5.13 The costs of providing new water are rising rapidly, while protection, conservation and reuse could enable demands to be met much more economically. To achieve economic gains, resources need to be protected, and water charges and pollution penalties have to reflect the true value of water.

5.14 As part of an overall strategy to protect health and the environment and to make the most economic use of all available water resources, present pollution trends should be reversed to progressively improve water quality. In this context, development funding agencies should take the initiative to encourage the incorporation of a significant element of environmental improvement in water related projects.

5.15 Within 10 years, programmes to provide sanitary containment or treatment for at least 50% of the pollution load (biological oxygen demand) from domestic wastes should be initiated. By

2015 every country should have achieved river water quality (varying from location to location) which safeguards supplies for downstream users.

5.16 Recommended actions include:

(a) Use scientifically established guidelines and set objectives for the protection of all river systems and groundwater resources, and translate the objectives into discharge quality and reuse standards for upstream municipal and industrial effluents; implement monitoring programmes, supported by enforced legislation and pricing mechanisms.

(b) Include water consumption and effluent load among the criteria conditioning the choice/approval and location of new industrial sites or expansions thereof and establish standards for effluent quality for existing and new industries.

(c) Improve agricultural, pastoral and forestry practices, including the controlled use of agro-chemicals, to reduce the degradation and depletion of water resources.

(d) Implement national programmes to introduce sanitary waste disposal facilities, based on low-cost improvable technologies, and to ensure that investment in public water supply is accompanied with appropriate investment in the removal, recycling, safe reuse and disposal of municipal wastes and surface water drainage.

(e) Increase environmental awareness through education and public relations campaigns to stimulate behavioural change to conserve water, combat pollution, and increase disaster preparedness.

(f) Enhance cross-sectoral information exchange and applied research on improved recycling techniques, groundwater treatment and protection methods and surface water drainage to abate runoff pollution.

Enhanced Access to Water, Sanitation and Waste Disposal

5.17 Accelerated provision of basic water and sanitation services is a prerequisite for improved health and for sustainable social and economic advancement. The poor put a high priority on the dignity and convenience of clean water and hygienic sanitation, reflected in a proven willingness to pay for reliable services.

5.18 Provision should be made for reliable water, sanitation, solid waste and drainage services to the urban poor, especially women and children, as a priority component of national environmental management strategies, involving the private sector and non-governmental organizations.

5.19 In urban areas, in accordance with national capacities and available resources, and with assistance from external support agencies, as appropriate, water supply and sanitation services should be extended with the aim of reducing the number of lacking services at the end of the International Drinking Water Supply and Sanitation Decade in 1990 to half that number by the year 2000 and to provide coverage for all by 2015.

5.20 Recommended actions include:

(a) Provide international technical and financial support to develop costed proposals (including operation and maintenance) for providing services to the urban poor, and allocate commensurate budgets.

(b) Ensure the use of progressive water tariffs, that reflect the true cost of providing and maintaining supplies, including cost-recovery, and encourage conservation and minimize waste. Ensure charging policies enable the very poor to receive basic services.

(c) Evaluate the scope for rehabilitating existing malfunctioning systems as an alternative to investing in new projects. Ensure the technical, institutional and budgetary requirements for future operation and maintenance are provided for in the planning, design and implementation phases of new projects. Establish preventive maintenance schedules, leak detection programmes, and regular quality surveillance. Develop guidelines and monitor the achievement of sustainable water and sanitation services.

(d) Encourage local water associations and water committees to manage community water supply and sanitation systems.

(e) Develop reduced-cost sewerage systems for low-income settlements and make low-cost water supply and sanitation technology choices available in all countries.

Health Impacts from Urban Water Resource Management

5.21 Contaminated and unreliable water supplies pose high risks of a variety of preventable communicable diseases. Medium and long-term plans for environmental sanitation should be established by 1995 to ensure permanent protection of vulnerable groups against disease risks, especially cholera. Consideration should be given to the creation of an international fund to respond to health hazard emergencies.

5.22 Recommended actions include:

(a) Provide international technical and financial support for the design and implementation of water supply and sanitation programmes to develop national inventories and address environmental health issues of vulnerable groups.

(b) Strengthen the monitoring and reconnaissance capabilities of water authorities to identify health risks, including those arising from the gathering of people, and to implement multisectoral rapid response interventions, such as those dealing with epidemics.

(c) Develop policies and an international clearing house for information, education and communications. Promote public education on improved domestic disinfection systems suitable for use with low-cost water supply and sanitation technologies, involving the participation of grass-root organizations.

Resource Mobilization

5.23 Unless the twin problems of water scarcity and pollution are tackled urgently and effectively, the cost of water will become an overriding constraint on national economic growth. Investments in urban water and waste management should be commensurate with the major contributions cities make to economic growth.

5.24 The willingness of unserved populations to contribute should be harnessed to invest in reliable services. Tariffs should be employed to ensure adequate cost recovery for upkeep and extension of services.

5.25 Recommended actions include:

(a) Undertake a global programme to promote public information and communication campaigns to mobilize support for achieving sustainable urban development, emphasizing the extent to which this is threatened by current trends. There is a need for realistic pricing, and for increased investment in water resource protection and pollution prevention.

(b) Provide technical support and build capacities to ensure financial viability, community involvement and decision making, including the participation of women, in investments, reducing unaccounted-for water and taking full advantage of recycling opportunities in municipal waste water and solid waste disposal.

(c) Undertake applied research to extend economic evaluation techniques to include environmental considerations in full.

6. WATER FOR SUSTAINABLE FOOD PRODUCTION AND RURAL DEVELOPMENT AND DRINKING WATER SUPPLY AND SANITATION IN THE RURAL CONTEXT

Introduction

6.1 For many developing countries, agriculture remains the dominant economic sector and the majority of their population are rural. While the rural population will grow in absolute terms, it will not only have to meet its own rising food requirements; additionally it will have to feed a rapidly increasing urban population. Meeting the basic needs of the rural populations, namely: drinking water, food, shelter, clothing, sanitation and primary health care, and the environmentally sustainable transformation of the subsistence agriculture to a productive and economically viable venture is the basis of rural development.

Principles

6.2 The key strategic principles for holistic and integrated environmentally sound management of water resources in the rural context are:

(a) Water should be regarded as a finite resource that has an economic value with significant social implications.

(b) Local communities must participate in all phases of water management ensuring the full involvement of women in view of their crucial role in the practical day to day supply, management and use of water.

(c) Water resource management must be developed within a comprehensive set of policies for human health; food production, preservation and distribution; disaster mitigation plans; environmental protection and conservation of the natural resource base.

(d) The need to recognize and actively support the role of rural populations with particular emphasis on women, given their role in feeding the world's population and protecting its environment.

Integrated Rural Water Management

6.3 In order to meet the basic needs of the rural populations, water development and management will have to be considered in an integrated manner. This integrated approach has to consider sustainable development programmes, including institutional and human resources development, protection of the environment and preservation of feed and food supplies.

Legislation and Institutional Arrangements

6.4 The adoption of more efficient water use, protection of water quality from pollution by agricultural chemicals and other contaminating materials, and establishment of clearly defined property rights and obligations require the introduction of appropriate legal instruments at local and national levels. Given the need to address multi-sectoral problems related to water use at the rural level, inter-institutional linkages will need to be established. Strengthening the capacity of institutions to administer the legal, economic and monitoring functions is essential.

Issues and Strategies

Efficient and Rational Allocation of Water: Quality and Quantity

6.5 A major part of the available freshwater,in the future, will be taken up to supplement rainfall for agricultural production. This is to meet the needs for food, fuel, fodder and fibre and timber of a rapidly growing population, especially in the developing countries. At the same time, the demands for good quality water for drinking and sanitation and for industrial use are rising sharply,

especially in the rapidly growing urban areas. Safeguarding good quality water is moreover necessary for fisheries and aquaculture, the maintenance of valuable natural ecosystems and environmental protection in general.

6.6 This combination of increasing demands on finite freshwater resources make them ever scarcer. It calls for a more efficient use of resources, specially in the agricultural sector, and a rational allocation between the various demand sectors. The main strategies should ensure that water users realize the scarcity value of the resource and incentives to promote this must be established. Measures would include demand management in the form of charging systems for efficient and just use of water; cost recovery policies to provide secure sustained efficient operations and maintenance of water supply systems; education and public information programmes; and legal entitlements for access to water resources. Such measures will have to be introduced with due consideration of the cultural, social and ecological values of water. Simultaneously priority should be given to meeting the basic needs of the poor, including drinking water and small scale agriculture. Prerequisites to resolving the competing demands are: comprehensive resource inventory and evaluation of existing land and water needs; the promotion of water storage and saving devices; and sound water use at watershed and village levels.

6.7 The quality of freshwater is declining in many parts of the world due to human induced land degradation, salinization, and pollution by chemical compounds and elements. The main strategy to combat this is arresting this problem at its sources, through incentives and regulations for environmentally sound soil and water conservation measures. Close monitoring of all waste disposals and contaminations is required as well as application of appropriate legal and administrative controls and the establishment of requirements for polluters to cover the cost of recovery of the water quality. To prevent losses in quantity and quality of agricultural produce, and protect human health, water quality standards for agricultural, drinking and sanitation uses should be set and appropriate mechanisms put in place for their effective implementation.

Water for Sustainable Agriculture

6.8 In many parts of the world, water use efficiencies are low both at irrigation scheme and at farm level. This has been the primary cause of waterlogging and salinization of irrigated lands, water losses, water-borne diseases and environmental degradation. The major strategies consist of: introduction of cost recovery mechanisms; demand management; close monitoring of irrigation system performance and water management at the field level; improvement to irrigation and on-farm infrastructures; and promotion of adaptive technological research and development as well as the dissemination of results. Additionally, irrigation institutions including water users associations will have to be strengthened.

6.9 Flooding, lack of adequate drainage, poor operation and maintenance of irrigation schemes, and inefficient water applications at the farm level have contributed to surface water stagnation, waterlogging and salinization of many irrigated lands and low-lying areas. They have resulted in not only loss in productivity of agricultural lands but also deterioration of the environment. The primary strategy consists of the reduction of the sources of excess water and provision of artificial drainage in existing wet croplands when necessary. It should be re-inforced by the introduction of efficient pricing and cost recovery mechanisms. Flood and rain waters causing temporary ponding on extensive plains can be contained for subsequent dry-season crop growth.

6.10 Improvement of rainfed agriculture by small-scale water programmes including collective well irrigation systems, small reservoir or tank irrigation schemes, multipurpose water harvesting projects, village drinking water supply and community garden programmes can fulfil many rural community needs and are sustainable. This may include diverting and storing of temporary excesses of rain waters and their subsequent use. The primary strategy consists of providing incentives, technical and institutional support to local communities to develop and manage water resources to meet their multiple needs.

6.11 Flood recession agriculture is a primary source of food supply on many major flood plains, its value in meeting the basic needs of the rural poor should therefore be given special recognition

when considering management of basin resources. Due consideration should be given to maintaining minimum water flows downstream when designing water management schemes.

6.12 Lack of good quality water limits livestock production under grazing and rangeland conditions. Solutions call for integrated land and water use strategies for the semi-arid areas to be developed in close cooperation with pastoralist populations and based on clearly defined property rights. The strategy consists of providing appropriately spaced and reliable watering points and grazing lands within sustainable land use systems. Livestock production is also the cause of water contamination because of improper waste management in high livestock density zones. Leaching into aquifers is to be reduced through better integration of livestock and crop production. Where livestock is one among competing users of a limited water supply, the opportunity value of the water in question must be established to assist in determining the efficient and equitable allocation of water.

6.13 Inland water fisheries should be managed to optimize the yield of aquatic food organisms through conservation of water quality and quantity and functional morphology of inland aquatic systems. Aquaculture should be promoted as a component of integrated farming systems. At the same time, aquaculture development and coastal fisheries will need to be guided to protect the quality of aquatic systems and the environment. The major strategy consists of promoting inland fisheries and aquaculture within the framework of national and international water resources planning and management. In the context of competing uses for water the opportunity value should be applied as in the case of water for livestock.

Providing Water Supply and Sanitation for the Unserved Rural Poor

6.14 Quite a significant rural population remains without reasonable access to safe drinking water and sanitation at the end of the International Drinking Water Supply and Sanitation Decade. There is a need to find means of encouraging rural communities to undertake local development initiatives with the resources available to them. The major strategies are: establishing national policies and budget priorities with regard to increasing service coverage; promoting appropriate technologies; introduction of suitable cost recovery mechanisms, taking into account efficiency and equity through demand management mechanisms; promoting community ownership and rights to water supply and sanitation facilities; and establishing monitoring and evaluation systems.

6.15 Insufficient funds, insufficient trained manpower, poor operation and maintenance of systems and lack of community participation were identified as constraints to sustainable water supply and sanitation services in rural areas. Lack of knowledge on health consequences of unhygienic services contributes to poor performance of water supply and sanitation systems after commissioning. The major strategy consists of strengthening the rural water supply and sanitation sector with emphasis on institutional development, efficient management and an appropriate framework for financing of the services.

6.16 Inadequate water supply and sanitation often results in a broad range of health problems including diarrhoea, schistosomiasis, and guinea worm infection. In addition, inappropriate water storage in and around houses and village ponds and irrigation and drainage canals may serve as breeding sites of vector mosquitoes that cause dengue and malaria. The strategy consists of hygiene education and elimination of transmission foci; adoption of appropriate technologies for water treatment; and wide-scale adoption of environmental management measures to control disease vectors.

Capacity Building

6.17 There is an urgent need for developing nations to build their own long-term capacities for integrated management of rural resources that support their communities. The major strategy consists of the creation of policy and legal frameworks, the development and strengthening of institutions, the dissemination of hydrological and other data bases, the promotion of community participation and the training of human resources, all on a continuing basis.

(i) Implement on a large scale appropriate mechanisms for sustainable service coverage of water supply and sanitation developed during the International Drinking Water Supply and Sanitation Decade to provide universal access.

(j) Include considerations of health consequences in all water resource programmes in order to enhance social and economic development.

(k) Ensure that by the year 2000 all countries and rural communities according to their capacities and available resources and with assistance from external support agencies as appropriate will:

(i) Have agricultural and water resources systems so that through local production and commodity trading, they will have access to sufficient food to meet their basic nutritional needs.

(ii) Have access to safe water in sufficient quantities and adequate sanitation to meet their health needs and maintain the essential qualities of their local environments.

(iii) Develop their water resource systems only as components of comprehensive integrated programmes designed to provide for long term sustainment of human welfare and the careful management of natural ecosystems

6.18 The actions at local, provincial, national and international levels will require an institutional framework, mechanisms for coordination within a country and between countries and the United Nations system of organizations and donor and financing agencies.

Actions required to meet the challenges

6.19 According to one set of projections the global population is expected to reach 8 billion by the year 2020. The consequent dramatic growth in food demand and the pressures upon the natural resource base pose an enormous challenge to the rural sector. The latter will not only have to substantially increase food production, but being the major user of water resources, it will have to release freshwater resources to meet increasing demands for domestic, industrial and ecosystem management purposes. Additionally the rural sector will have to significantly contribute to the conservation of the natural resource base.

6.20 Recommended actions include:

(a) Strengthen national capacities to plan, implement, and monitor integrated water management programmes. The major strategy is to create policy and legal frameworks on a participatory basis, as well as develop and strengthen institutions at all levels. This should be accomplished with emphasis on community participation and human resource development taking into consideration the full involvement of women who constitute a substantial number of the world farmers.

(b) Resolve competing demands on water resources through the application of appropriate economic, legal and institutional mechanisms. This objective is achievable through: better integration of water use within the framework of overall national economic, agricultural and environmental policies and adoption of demand management strategies ranging from appropriate pricing policies to implementation of relevant legal frameworks and entitlements supported by the widespread introduction of water saving technologies.

(c) Promote and actively support water conservation and water use efficiency in agriculture with the objective of making more water available for domestic and industrial use as well as for ecosystem management.

(d) Actively promote the use of participatory mechanisms for involving communities, with emphasis on the role of women, in the planning and implementation of programmes for agricultural water use, water conservation, and water supply and sanitation.

(e) Introduce and actively use baseline assessments, selection of readily measurable indicators, effective monitoring mechanisms during project implementation and evaluation of achievements against set objectives.

(f) Meet the food needs of 8 billion people by 2020 through substantial increase of efficiency of water use in existing irrigation schemes, maximize water conservation in new irrigation schemes and improve drainage in wet and saline croplands. Increased water use efficiencies must additionally be sought in rainfed agriculture through effective measures including flood management and drought mitigation. The enhancement of food delivery by the rural sector should be complemented by other measures including widespread introduction of drought resistant crops, insect and rodent control, effective storage and transportation.

(g) Activate mechanisms to provide rural populations with better access to essential technical and environmental information, in order strengthen their role in decision making processes.

(h) Adjust agricultural land use practices and improve rural sanitation and community and industrial waste disposal to improve the protection of ground water and surface water including coastal seas.

7. MECHANISMS FOR IMPLEMENTATION AND CO-ORDINATION AT INTERNATIONAL, NATIONAL AND LOCAL LEVELS

Appropriate levels of management

7.1 Centralized and sectoral (top down) approaches to water resources development and management have often proved insufficient to solve local water management problems. The role of governments needs to change to ensure a more active participation of people and local institutions, public and private. The levels at which effective management decisions can be taken and problems can be solved vary from country to country, as do the relative roles of institutions in the administrative (socio-political) and hydrological (catchment/river basin) structures. The fundamental principle remains however that, in any given situation, water resources should be managed at the lowest appropriate levels. The need for integration of sustainable water management with land use management, preservation of the environment and the reconciliation with other sector interests has to be recognized. In particular, the needs of human settlements, agriculture and industry have to be managed and based on a balanced consideration of the total needs of people and the environment.

Mechanisms at the national level

7.2 While the principle of the management of the resource at the lowest appropriate level requires a decentralized approach to water management, such an approach would fail if it were to operate in an institutional vacuum. There is a need for institutional arrangements at the national level, such as a national water authority, capable of defining priorities, policy directions, targets and, where appropriate, prescribing standards. The term "authority" is used in this context to reflect its function of facilitating the implementation of water resources development and conservation activities and a system of checks and balances to safeguard public and national interests and to promote improved management.

7.3 The most pivotal and complex function of a national authority lies in the establishment of effective integration of the overall socio-economic and environmental decision-making process with the formulation of water resources policies and programmes. Similar linkages are required in order to conserve ecosystems and development needs on a sustainable basis. Such an authority may also provide an enabling environment for local resource mobilization and the flow of financial resources and the co-ordination of external support. Other functions of a national authority could be concerned with the co-ordination and management of data, including national monitoring networks, the formulation of a regulatory framework, the facilitation of technology transfer, the support of human resources development, the promotion of sustainable water management and full public participation in all aspects of water.

7.4 The national authority provides the necessary support for river and lake basin authorities or committees with responsibility for the integrated management of the water resources in the basin. At the very least, a central authority needs to provide a system of linkages between existing organizations dealing with water resources, with a view to harmonizing approaches and policies. In the case of federated countries, parallel state or provincial authorities may be needed to perform related functions falling under the jurisdiction of states or provinces.

7.5 Recommended actions to include:

(a) Assess current organizational arrangements as part of national action plans for sustainable development.

(b) Establish and strengthen national water authorities and river basin entities as required.

(c) Support and strengthen further development of water legislation and institutional mechanisms for the co-ordinated management of water resources to ensure sustainable development.

Transboundary basins

7.6 The most appropriate geographical entity for the planning and management of water resources is the basin, including its surface water and groundwater. Ideally, the effective integrated planning and development of transboundary river or lake basins has similar institutional requirements as in the case of a basin entirely within one country and should be based on the same principles. The essential function of existing international basin organizations is one of reconciling and harmonizing the interests of riparian countries, monitoring water quantity and quality, development of concerted action programmes, exchange of information, and enforcing agreements. As regards transboundary groundwater basins, exploitation of such aquifers should take into account the safe yield of the live aquifers while developing principles for the control of pollution.

7.7 Recommended actions to be taken by Governments include:

(a) Evaluate the experience gained with existing transboundary basin water authorities, committees and commissions.

(b) Support the further development of legal principles and institutional mechanisms for the co-ordination of water management within transboundary basins.

(c) Promote the co-operation of riparian countries within a transboundary basin in the establishment of appropriate legal, institutional and operational mechanisms.

International implementation mechanisms

7.8 Regional and global dimensions of water problems are rapidly growing in importance. Water resources are coming under increasing stress with the growth of populations, while water is now recognized as the central component of global ecosystems and of the climate system. This requires the strengthening and development of a framework for the formulation of international water-related monitoring, programmes, policies and strategies. Such a framework must ensure that water problems are considered in the wider context of environmental and sustainable development issues.

7.9 Recommended actions include:

(a) Existing regional mechanisms of a continental and sub-continental scale should be strengthened to harmonize policies, strategies and programmes, and similar mechanisms should be implemented in other regions as well, as needs arise.

(b) Co-operation on a regional basis for the exchange of experience in the protection and use of transboundary waters, including legal mechanisms and institutions should be promoted.

(c) Functions and capacities of intergovernmental bodies should be reviewed, including United Nations institutions, regional and sub-regional organizations and non-governmental organizations; identify key needs not adequately addressed by these bodies; and make concrete proposals for strengthening intergovernmental bodies and further improving co-ordination with member states.

(d) The United Nations Conference on Environment and Development and its Earth Charter should reflect the principles required for development, use, conservation and protection of water resources and aquatic ecosystems especially in their international aspects.

(e) Adequate international exchange of data on the components of the water cycle in terms of quantity and quality should be promoted, through established international programmes for such exchange and the use of international data centres, and supported by regulations under international law specifying mutual obligations and rules of procedure.

(f) Countries should ensure that effective flood and drought warning and preparedness systems are part of national sustainable development plans, within the framework of the International Decade for Natural Disaster Reduction.

(g) International co-operation should be strengthened to expand national financing of environmentally sound and socially responsible water activities.

Global co-ordination

7.10 At present, international arrangements are lacking for the effective co-ordination of global freshwater activities by multilateral, bilateral, and non-governmental organizations. A major problem is the lack of linkages between the community of external support agencies, governments and non-governmental organizations which deal with water resources co-ordination and facilitation.

7.11 Suitable arrangements should address the following key needs:

- raising the global profile of freshwater issues and maintaining that profile in the period after the United Nations Conference on Environment and Development, with a view to ensuring sustained global commitment to addressing freshwater problems;

- improving opportunities for co-ordination of water programmes, particularly those of the external support agencies (bilateral and multilateral);

- providing a forum to encourage dialogue and confidence-building measures regarding transboundary issues among riparian countries;

- facilitating discussions and the development of recommendations, based on shared experience in areas related to water management, such as legislation, research and development, and technology transfer;

- reviewing progress in the implementation of the freshwater programme areas of Agenda 21.

7.12 The following specific actions are recommended:

(a) Strengthening United Nations institutions such as the ECOSOC Committee on Natural Resources and enhancing interagency co-ordination through mechanisms such as the Intersecretariat Group for Water Resources;

(b) Supporting the establishment of a facilitating mechanism, such as a world water forum or council, by which water specialists in various constituencies such as governments, international bodies, non-governmental organizations and private sector bodies could co-operate.

8. OPTIONS FOR FOLLOW-UP

8.1 A number of recommendations to improve management of water in an environmental context and as a key element of sustainable development have been made in the earlier sections of this report. These recommendations and the analysis will go forward to the Preparatory Committee for the United Nations Conference on Environment and Development (UNCED), the Earth Summit, in Rio de Janeiro, June 1992. The UNCED preparatory process has already developed a draft programme on water and environment which will be modified in the light of the Dublin Statement and Conference Report. The Earth Charter and Agenda 21 which will be discussed at UNCED (often described as the Earth Summit) will contain a number of calls for action on water and environment at national, regional and international levels.

8.2 Experience with the Mar del Plata Action Plan (UN Water Conference, 1977) has shown that procedures and mechanisms for follow-up to ensure progress on the required action are essential to achieve the defined goals. The Dublin Conference urges that UNCED ensures a strong follow-up process for all matters covered by Agenda 21.

8.3 Unlike many other sectors, there is no global intergovernmental organization that could be logically charged with taking a comprehensive overview of progress on water-related aspects of Agenda 21. With this in mind the Dublin Conference considered possibilities for an UNCED water follow-up. The first need is to strengthen existing United Nations institutions, such as the - Committee on Natural Resources of ECOSOC and the Intersecretariat Group for Water Resources. However, neither mechanism provides for involvement of all interested governments together with private sector groups, so important in water management issues. In addition to strengthening United Nations bodies and to provide for a wider sector involvement, one option is the establishment of a more comprehensive world water forum or council, similar to the existing Collaborative Council on Water Supply and Sanitation, to which governments, international and regional bodies, non-governmental organizations and private sector bodies could adhere.

8.4 Which of these options or other mechanisms are adopted by UNCED depends to a considerable extent on the more general follow-up mechanisms adopted by the Earth Summit. The Dublin Conference urges that any such follow-up mechanisms or arrangements provide specifically for appropriate periodic reviews by a competent body of progress on water-related issues of Agenda 21.

8.5 At the national level, governments are urged to consider after the United Nations Conference on Environment and Development assigning to an appropriate national body the task of following the implementation and reviewing progress on the water-related issues of Agenda 21. Such bodies should work in close collaboration with external support agencies operating in the countries.

8.6 At both national and international levels the first major assessment to identify progress in water-related issues should be undertaken by the year 2000.

8.7 The Conference recognizes the need for mobilizing resources from all sources for the vital work outlined in its report and urges UNCED to ensure that the water-related issues are taken into consideration in funding the implementation of Agenda 21.

8.8 The Conference participants urge all governments to study carefully the above recommendations and to translate them into urgent action programmes for WATER AND SUSTAINABLE DEVELOPMENT.